THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. X. No. 217—13th YEAR.] LONDON, FEBRUARY 12, 1861. [Subscription per Ann. { 15s. in Advance / 18s Credit.] DOUBLE No Price 1s.

TO GAS COMPANIES.

FIRE-CLAY Retorts and Fire Goods.

The Advertiser has brought his Fire-Clay Retorts to great perfection, both as to quality and finish. Many have stood three and four years.

Every description of Fire Goods in any quantity always on hand. The Fire Clay is the very best in the North of England. Stock never less than 10,000 tons weathering.

Orders promptly executed.

Apply, G.H. RAMSAY, of Derwenthaugh Fire-Brick Works, near NEWCASTLE-ON-TYNE.

Aug. 22, 1856.

SUNDERLAND GAS COMPANY,
NEW WORKS, HENDON.
NOTICE TO CONTRACTORS.

THE Directors of the Sunderland GAS COMPANY are desirous to receive TENDERS for the CONSTRUCTION and COMPLETION of certain portions of their intended additional GAS-WORKS, near the Blue House, Hendon, and adjoining the Durham and Sunderland Branch of the North-Eastern Railway, comprising a RETORT-HOUSE, CHIMNEYS, PURIFYING-HOUSE, and other Buildings connected therewith, and a COTTAGE.

Drawings and Specifications may be inspected at the OFFICE of the COMPANY, 61, Fawcett Street, SUNDERLAND, and at the OFFICE of Mr. T. HAWKSLEY, C.E., 30, Great George Street, WESTMINSTER, S.W., on and after Monday, the 11th of February instant, where bills of quantities may be obtained on payment of 20s. for each set.

Tenders must be delivered at the Offices of the Company, in manner and form required by the Specification, on or before Tuesday, the 26th of February instant.

The Directors do not pledge themselves to accept the lowest or any other Tender.

By order,
JOHN H. COX, Secretary.

Sunderland, Feb. 6, 1861.

WANTED, an Agent residing at Cologne, to undertake the SALE of IRON, BRASS, and COPPER BOILER TUBES; also GAS, STEAM, ENAMELLED, and GALVANIZED TUBING, &c. &c. &c., for the Districts of Holland, Belgium, and the Rhine.

The best Testimonials, as well as experience in the trade, will be required.

Address, by letter, to C. M. M., Post Office, BIRMINGHAM.

WISBECH GAS-WORKS.

THE Directors of the Wisbech Gas-light and Coke Company Limited, require the services of a RESIDENT MANAGER on the 31st of March next, and are prepared to receive applications from persons thoroughly qualified, by practical experience, for the situation.

The Manager will be expected to take the entire charge of the plant and works, to keep the accounts and books, to collect all moneys due to the Company, and to perform such other duties as usually devolve upon Managers of Gas-Works.

Security in an amount to be agreed upon, will have to be given.

Applications, stating age and salary required, with Testimonials of character and fitness, to be delivered to me on or before the 22nd of February next.

EDWARD H. JACKSON,
Clerk to the Company.

Wisbech, Jan. 21, 1861,

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ONE-THIRD of Furnace Fuel com-monly used saved. A Six or other sized Bed of Retorts can be changed at once into a Three or Two-Bed, &c., when working or down. "*Furnace fed with two currents of* HEATED *air to intensify combustion.*"

The Fire playing on the back and two side walls, also covering arch in common settings, is permeating on larger-sized retorts. An effectual method devised for destroying the incrustation of Carbon inside Retorts. The patent Retorts and Furnaces are more easily repaired than the common settings.

Prices, Plans, &c., obtained from GEO. WALCOTT, 24, Abchurch Lane, LONDON.

French Patent for Sale.—Gas-Works Bought.

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FOR Sale, several lengths of Hydraulic MAIN, 14 inches diameter and 6 feet 9 inches long, with 7 holes for DIP-PIPES.

Also 4-inch ASCENSION-PIPES, and 3-inch ARCH and DIP-PIPES, and RETORT MOUTHPIECES, all in excellent condition, and will be sold at a very low price, and delivered, if required, at any Railway Station in London.

To be seen, on application to the ENGINEER, at the Equitable Gas Company's Works, Lupus Street, PIMLICO.

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JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their Works as above.

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Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanized Tubes, &c.

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London: JOHN WEALE, 59, HIGH HOLBORN.

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Established for the erection of gas-works in provincial towns, or the purchase or leasing of existing works on equitable terms. Application to be made to the Engineer to the Company, Mr. H. P. STEPHENSON, 58, PALL MALL.

WANTED to Purchase, Two Good SECOND-HAND PURIFIERS, size from 6 ft. × 4 ft. to 8 ft. × 6 ft.

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Also a WROUGHT-IRON ROOF, 191 feet long, and 77 feet span.

Plans and Specifications may be seen, and any further information obtained, on application to Mr. G. T. HALLS, the Manager on the Works.

Printed forms of Tender will be provided, which must be filled up, endorsed, and delivered at the Gas-Works, Lamb Lane, SALFORD, on or before Tuesday, February 19, 1861.

By order,
GEORGE BRETT, Town-Clerk.

Lamb Lane, Salford, Jan. 23, 1861.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS,
NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

London Agents:
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TO GAS COMPANIES.

THE Advertiser, aged 24, is open to an ENGAGEMENT. He has had five years experience in a Provincial Gas Company as Clerk, Inspector, and Collector; and can give first-rate references from his former employers.

Address ROBERT WAKEFORD, Gas Office, 29, St. Swithin's Lane, LONDON.

WANTED, at Market Rasen Gas-WORKS, a steady, respectable WORKING MAN, who thoroughly understands the manufacture and distribution of Gas in Clay Retorts, the laying of Mains and Services, the fixing, repairing, and registering of Meters, and who has a knowledge of Interior Fittings, &c., and can be well recommended.

The population is not more than from 2000 to 3000; a person is therefore required who can perform the whole of the work, except in the winter months, during which he will have the assistance of another man.

Application, stating age, wages required, and other particulars, with testimonials of character and fitness, to be sent to Mr. RHODES, the Secretary.

TO MAIN-LAYERS AND GAS APPARATUS FITTERS.

WANTED, several Steady Men, to PROCEED to the NORTH of ITALY early in MARCH, to lay Mains, Services, and to erect Gas-Works.

All applications must state age, the amount of wages required, and give references. The expenses, going and returning, will be paid by the advertiser, GEO. BOWER, St. Neots, HUNTS.

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THE Advertiser wishes a Situation as MANAGER, or FOREMAN, INSPECTOR, MAIN and SERVICE LAYER, GAS-FITTER. Can be well recommended; and is a good Accountant.

Address X. Y. Z., 51, Church Street, Luton, BEDS.

THE Advertiser, a young man, wishes for a Situation either as CLERK, INSPECTOR, or MANAGER of a Gas-Work in a small town. Thoroughly understands the manufacture and distribution of Gas in Iron or Clay Retorts, the laying of Mains and Services, fixing and registering of Meters, and a practical knowledge of Interior Fittings, &c. Has held similar situations, and can produce good Testimonials from present and previous employers.

Address A. B. C., 20, Garnault Place, CLERKENWELL, E.C.

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WANTED, by the Advertiser, a Situation as MANAGER of Gas-Works. He thoroughly understands the manufacture and distribution of Gas, laying Mains and Services and Interior Fittings, fixing and taking accounts of Gas-Meters, and setting of Retorts, having had many years experience in the above business; and can produce good Testimonials as to character and efficiency.

Address W. H., care of Mr. COOK, Walmer Castle Hotel, Deal, KENT.

TO GAS COMPANIES.

WANTED, a Situation as Manager of Gas-Works, INSPECTOR, or in any capacity where an energetic young man is required. Thoroughly understands the management of Works, Main and Service laying, Meter fixing, and Gas-fitting in all its branches. Would not object to go abroad. Has good references.

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FOR SALE.—A Second-hand Cast-IRON TANK (good as new), 36 feet 6 inches by 12 feet deep, with Seven Cast-Iron Columns; 6-inch Inlet and Outlet Pipes complete.

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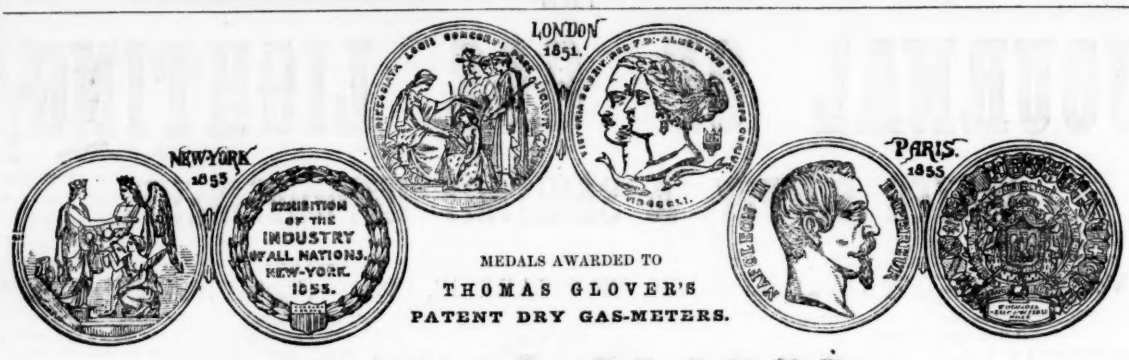

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PATENT DRY GAS-METER MANUFACTURER,

SUFFOLK STREET, CLERKENWELL GREEN, AND
ALLEN STREET, GOSWELL STREET, E.C.

Established 1844.

LORD REDESDALE'S "SALE OF GAS BILL."

LONDON, August 15, 1859.

THOMAS GLOVER takes the earliest opportunity of intimating to Gas Companies and his other Customers that, as Lord Redesdale's "Sale of Gas Bill" has determined the unit of measurement, he is now prepared to supply his Patent Dry Gas-Meters guaranteed to meet all the legal requirements of that bill.

THOMAS GLOVER confines his sole attention to the business of Gas-Meter Making. The propriety of his doing so is satisfactorily proved by his success; and, without the practice of any quackery, or any attempt to delude the public by an absurd exhibition of "Old and New Valves," his Meters are in general use by the Metropolitan Gas and other Companies in this Country and abroad. For example, one Metropolitan Company have now in use above **12,500** of his Patent Dry Gas-Meters; some of these Meters have been fixed for Fourteen Years, and are still in working order, without complaint from either the Company or the Consumer.

THOMAS GLOVER thinks it necessary to put Gas Companies on their guard against parties selling Patent Dry Gas-Meters constructed in imitation of his, but unskilfully made on erroneous principles, and with improper and unsuitable materials.

THOMAS GLOVER'S Workshops are now the most extensive in this or any other Country, and he is thereby enabled promptly to execute orders to any extent required. Purchasers may at any time inspect his Works and the Materials of which his Meters are constructed. He is ready to enter into Contracts with Gas Companies and others to uphold their Stock of his Meters for Twenty Years at an annual charge varying from 2½ to 5 per cent., and to leave always in the hands of Gas Companies Three Years' charge for upholding, as a guarantee for the fulfilment of the Contract.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON,

Beg leave to inform Gas Companies and others that, having completed the alterations in rebuilding and enlarging their works, they intend manufacturing DRY as well as WET Gas-Meters.

In adding this important branch to their business, W. Parkinson and Co. pledge themselves to use the same quality of materials and workmanship in the Dry as in their well-known Wet Meters, and which for above forty years has enabled them to maintain a superiority over all others.

Owing to the facilities offered by the extension of their factory, a large quantity of both Wet and Dry Meters will always be kept in stock, which will enable them to execute all orders with as much promptitude as hitherto, and thereby gain the same patronage previously extended to them, and which they now respectfully solicit in this new undertaking.

JOURNAL OF GAS LI... NEWSPAPER

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TO CORRESPONDENTS.

W. B.'s *question may be intelligible to himself, but is not so to us. Does he mean the degree of temperature required to drive off the gas and other volatile matters from dry coal?*

NOTICES.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 12, 1861.

NOTES UPON PASSING EVENTS.

AMONG the measures recommended to the attention of Parliament in the Queen's Speech, there is one, "for rendering more easy the transfer of land," which affects every public company with works to carry out, and every private individual who is making agricultural improvements of any kind, but especially of drainage and irrigation. To sell, to buy, to exchange land, under the present state of the law, is too often a desperate, dangerous, and costly operation, the sure forerunner of endless anxieties. The reform of land transfer laws has been before the public for many years—for so many, that the old race of obstructive parliamentary lawyers has become almost extinct, and more honour is to be had, on either side of the House, as a legal reformer, than as a legal abuses defender. For this happy change in the opinions of country gentlemen, once the staunchest supporters of every abuse approved by Lord Eldon, we are very much indebted to that eccentric genius, the late Henry Drummond, M.P. for Surrey. In 1849, when moving the second reading of his Transfer of Real Property Bill, he hit off the helpless condition of acred squires and lords very happily:—"The owners of property are completely in the hands of their solicitors. They know no more about their lands than they do about what is going on in China. They know there is a box of parchments belonging to them, and that some of those parchments have a bit of red wax tied to them, but that is all they know. Their solicitor brought them a paper to sign, and they signed it; and, after putting a seal upon it, they delivered it as their act, but what it contained they know no more than the blushing bride of the marriage settlement to which she was led forward, covered with a veil, to put her name." "Now, I contend," said Mr. Drummond, "that, unless you cut up the whole system by the roots, you will do nothing. I want to make the country gentlemen understand, that it is their business to deliver themselves out of the hands of the solicitors." "You are a solicitor-ridden people." "The landlords must not rest satisfied until they have obtained the means of transferring any portion of their land, which they please to sell, in as easy and simple a manner as they could transfer stock in the books of the Bank of England;" and a little further on he described "an equity lawyer" as like a rural policeman—when he sees a man in a good coat, he thinks he ought to be "had up" before a magistrate, and made to give an account of how he came by it; and a Chancery lawyer says to the country gentleman—"Ah! it is very well for you to suppose that these broad acres belong to you, but has your title ever been examined?" He quoted, as an instance of what could be done, the following letter describing the practice of the island of Guernsey; he might have quoted, as Sir Walter Raleigh did, the practice of Holland more than three hundred years ago: "At twenty-five years of age, I bought a house, garden, orchard, &c., in Guernsey. The vendor and his wife met me at the Registrar's office. We went before the chief Magistrate, and declared that the vendor and his wife consented to the sale. I, on my part, declared I wished to purchase. We all went down out of the Court-room to the Fief's office. The tranfer was then registered in the Court books, with our names, dates, &c., written on the back of the contract-deed; the vendor paid a fee, and all was complete. I kept the property some years, then sold it in the same easy manner."

The attempts to improve and simplify the transfer of land commenced more than 150 years ago. In 1703, the Yorkshire Registry was enacted; in 1708, the Middlesex Registry. In 1728 and in 1732, bills brought in for establishing Registries in Surrey and in Derbyshire were lost. In 1739-40, the House of Lords directed the Chief Justice and the Judges to prepare and bring in a bill for a general scheme of Registration. It was brought in, carried through both Houses, but lost by the prorogation of Parliament before it could receive the Royal assent. It was brought in again, and lost in the House of Commons, through the opposition of lawyers, by a majority of one. In 1813, the subject was taken up by the great law reformer, Sir Samuel Romilly, and opposed and defeated by the Eldon school of politicians. In 1828-9, Lord Brougham, then Henry Brougham, found that the Yorkshire attorneys would not let him carry Yorkshire, if he adhered to his Registration of land plan. In 1830, 1834, and 1845, attempts in the same direction were made without success. In 1849, Mr. Drummond brought in his first bill. In 1853, he tried again with a bill "to facilitate the sale and purchase of land." It was on that occasion that he told a story, showing that very great men sometimes father very nonsensical Acts of Parliament. He said—"I was once sitting next to Sir Robert Peel, when a certain bill, which had been introduced by the government was under discussion; and I pointed out to him a particular clause in the bill, saying, 'Is not this clause perfect nonsense?' Sir Robert looked at it and said, 'It is nonsense; you had better go and show it to Lord John.' I walked across the House, and showed it to Lord John, who said, 'The clause is nonsense; but I have nothing to do with it; it is Peel's bill.' I brought it back to Sir Robert, and told him what the noble lord had said. He replied, 'It is true I brought it in, but it was by order of government; and old Eldon was Chancellor at the time, and he never would let the law officers do their duty. He always would meddle, and the clause is nonsense.'" After Lord Campbell had failed in carrying out what he commenced as plain John Campbell, there was a long pause until 1859, when Sir Hugh Cairns brought in a very creditable bill, which Sir Richard Bethel opposed, thinking it, no doubt, too good a thing for the Conservatives to complete during their short lease of office. This session, as we are not to be troubled

with any constitutional reforms, it is to be hoped and believed that the great légal lights will combine in a working measure that will, in some degree, protect landowners not only

"Against that universal scourge,
A rascally attorney,"

but the respectable and not less expensive hair-splitting conveyancer.

It seems quite settled that, unless a European war should break out in the mean time, an attempt at a Universal Exhibition will be made in 1862. A commission has been incorporated under Royal Charter, and a deed, guaranteeing something like £300,000, has been signed by a large number of wealthy, responsible parties, as well as by a considerable number who are not wealthy, and who, in the present aspect of the affair, are very sorry that their ambition led them into such good company. The conditions and forms of tender for erecting the building are out, and promise an enormous edifice, and a very pretty job for somebody. The architect has been settled, without noise or competition—Captain Fowke, R.E., whose architectural reputation is based on the miscellaneous edifices, best known as the Brompton Boilers. Designs, involving a cost of some quarter of a million, have been prepared, and are to be carried out by this fortunate gentleman, who, at one step, has obtained an opportunity such as falls to the lot of few men of genius in a lifetime. The arrangement would look awkward were not its fitness and honesty guaranteed by such names as those of Mr. Wentworth Dilke and Mr. Henry Cole, C.B., the active authors of this 1862 Exhibition. There cannot be a doubt that they have weighed and measured all the constructive talent of the kingdom, and settled, on the best possible grounds, that there is "nothing like Fowke" to be found out of the South Kensington Museum. Some architects and engineers are very angry at this swift and secret selection of the friend at Court; but they are unreasonable. How much more provoking it would have been to have been invited to compete when the decision was already settled, practically, on the man whom, to paraphrase Pope,

"H. Cole selects, and Wentworth Dilke approves!"

The arrangements for the construction of the building have not, from the nature of the matter, been managed quite so comfortably; but they are well done, and the contractor, who now goes to the trouble and expense of tendering for them, must do so with his eyes open, with a full assurance that the most eligible contractor was known before the tenders were issued. We are indebted to Sir Joseph Paxton for a luminous criticism on these last publications of the Kensington Museum. No one is more competent; for, probably, no one has ever had so great an opportunity of seeing money wasted in carrying out grand designs under close contracts—as, say, for instance, those wings and towers, neither useful nor ornamental, of the Crystal Palace. The buildings and works are divided into the following portions:—A, about 2300 feet of picture-gallery, varying from 55 to 35 feet wide, and from 70 to 60 feet high, to be built in brick. B, a hall about 550 feet long, 250 feet wide, and 220 feet high, to be built chiefly of iron, wood, and glass. C includes the nave and transepts, about 2200 feet long, 80 feet wide, and 100 feet high, and polygonal entrances, about 150 feet high, to be erected in iron, wood, and glass. D consists of about 260,000 superficial feet of buildings, about 50 feet high, with galleries, built chiefly of iron, wood, and glass. E consists of sheds of wood and glass, about 4000 feet long, in widths of about 50 feet wide, and about 35 feet high. No bills of quantities are to be furnished. The time given for inspecting and tracing plans, and making the needful calculations, was from the 1st of February to the 8th, between the hours of ten and four. The tenders to include terms for purchase and terms for temporary use of any part. Sir Joseph Paxton, at a rough guess, estimates the cost of these works at £250,000, and that, to make accurate bills of quantities, would take a contractor nearly a month; and he considers that no prudent contractor would think of tendering without them. All which is very likely true. But Sir Joseph, with his large experience, ought to be pleased, not angry, that the presiding authorities of South Kensington should have so arranged that he will not be tempted into wasting his time, and his clerks time, in preparing a tender which will not be accepted.

Such is the fickleness of the public mind, that it is impossible to say whether they will be satisfied with the ingenious arrangements made for a great Show in 1862—yet the sight-seers ought to be. The South Kensington Museum, which is already one of the best sights in London, requires additional picture-galleries; the Horticultural Society, something to set it a-going with a *sensation* on its new grounds; and the gentlemen who were unrewarded, or, as they consider, imperfectly rewarded for their exertions in 1851, want another chance of profitable employment, and honorary rewards. The device of a guarantee-fund, headed by attractive names, has done what universal enthusiasm did in 1851; we shall have a very fine display of works of art, and a very brilliant display of those manufactures that can be sold by sample. It will be, in fact, a great fair or bazaar, a very amusing lounge to the multitude, useful to a few art-critics and students of science, although no more a museum or school of manufactures than the shops of Alderman Mechi, or Jackson and Graham. Manufacturers since 1851 have tried Paris and New York, and become very sick of exhibitions. Then towns united, and manufacturers made sacrifices to represent fully the raw material and the wholesale manufactures of each district. Since that time, the cant of art-manufactures, operative-progress, and other watch-words of the Sydenham Palace speculators, have been worn threadbare. The 1862 Exhibition will amuse the public, which is always a good thing, and replenish the funds of the Horticultural Society, which is not a bad thing, and perhaps improve the position of some of the South Kensington officials—perhaps drop a knighthood on the Boilers, and a long-desired baronetcy in Sloane Street, which will not hurt any one; but the less said about "progress," and "art," and "science," the better. Scientific manufactures and artistic progress have very little to do with shows at a shilling.

The report of Mr. W. Haywood, the engineer to the Commissioners of Sewers of the City of London, made on the 21st of January, lately printed, of course refers to several projects which have fallen stillborn, without reaching the preliminary stage of parliamentary discussion. The first point that strikes us in this report is an obvious imperfection in our private bill legislation. Mr. Haywood is compelled to advise the Corporation to dissent from measures of which he approves, because that is the only mode by which a *locus standi* for negotiation or opposition on any one point can be obtained. Tunnelling is the leading feature of the projected City railways. The Metropolitan extension to the proposed Finsbury Circus station is by a tunnel throughout. So is the proposed junction of the Eastern Counties Railway with the same Circus station. It includes, in improved approaches, "a street fifty feet wide, which leaves Liverpool Street, near Baker's Buildings, and proceeds northwards to the elbow in Broad Street Buildings; from this point, it is projected to widen Broad Street Buildings to a width of sixty feet, the whole length of Broad Street." The loop-line of Metropolitan Railway from the main line in Victoria Street to the new meat market is also in a tunnel. The East London Railway, from the Eastern Counties and Finsbury extension to St. Katherine Street, 150 feet from Irongate Stairs, with, first, a branch to the warehouses of the London and North-Western Railway in Haydon Square; a second to the Great Northern dépôt, on the south side of the Blackwall Railway; and a third to the new warehouses, in Royal Mint Street, of the Victoria Dock Company, is to be entirely constructed in tunnels. The North London Branch Railway, from Liverpool Street to Kingsland, is proposed to pass through the City on a viaduct, but it is doubtful whether this scheme will be prosecuted. The projected Charing Cross Railway branch to Cannon Street, crossing the Thames near the Steel Yard, would be on a viaduct, so as to be nearly on a level with Cannon Street in the City.

The site on which the concentration of the courts of justice, or Palace of Justice, is to be erected is very large—bounded by the north side of Carey Street and Gate's Court; east, by Bell Yard, Fleet Street; south, by Fleet Street and the Strand, from Bell Yard to Clement's Lane; and west, by a line running from Horse-Shoe Court, Clement's Lane. "The total area is about sixteen acres: Temple Bar itself is scheduled." Mr. Haywood reports that "the number and variety of projects nearly approaches the year 1846 (when nine different railway companies gave notice of their intention to enter the City, and an area of 100 acres was scheduled). The number of schemes is ten, and the total area scheduled is 84 acres, not including 13 acres of river-bed; 52½ acres of property are threatened with demolition, and 160 public ways stopped up, altered, or interfered with." "The most striking feature is the convergence of the whole of the schemes to the commercial centre. The extension of the Metropolitan and Eastern

Counties Railway to Finsbury Circus, and the placing of the City terminus of the Charing Cross Railway in Cannon Street, and of the North London Railway in Broad Street, would enable a large portion of the metropolitan population, as well as those from the country, to enter or leave the City, or pass through it to either of the suburbs, with a certainty as to time and comfort to which they have long been unaccustomed." "Another important feature is the projected construction of direct *approaches* to the new termini. One of these, by opening out a poor district, will make what is at present comparatively valueless, valuable." "The demolition of property for the new courts of justice will afford means for widening Fleet Street in the immediate neighbourhood of Temple Bar." The construction of some of the railways will necessitate the occupation of large streets for months; other streets will disappear altogether from the City map, giving place to the structures erected for railway purposes, or new buildings; and it is scarcely too much to say, that the existing plan of sewerage of a considerable portion of the City must be destroyed, and miles of sewers reconstructed." The engineer concludes by saying, that most of the projects are "fraught with great metropolitan benefit," although the Commission, in order to obtain power to negotiate in details, must dissent from all.

A Paper on "Food, its Adulterations, and the Methods of Detecting them," read at the Society of Arts, on the last Wednesday in January by Mr. Scott, afforded an example of most of the errors and advantages of discussions on such sanitary subjects. There was a good deal of exaggeration, there was something very like puffing particular tradesmen—a style of advertising which has grown up with the anti-adulteration agitation—and there was the curious recommendation, by way of conclusion, that the Society of Arts should appoint a special committee, in which "trade, manufactures, common law, science, chemistry, and medicine, should be represented." With this volunteer committee, Mr. Scott promised to anihilate adulteration within six or seven years! We cannot go so far as Mr. W. Hawes, who objects to any legislation against adulteration; or as far as the sanitary doctors, who suggest that every shop should be under the direct supervision of a medical inspector. It is quite as proper that we should be protected against false injurious quality as against short weights and measures. The fraud is as great, if a tradesman sells me chicory for coffee at coffee price, or sand for sugar, as if he put light weights in his own scale; and it is still more a fraud if he sells my children poisonous comfits for sugar sweetmeats. But, if the penal laws are to work, they must be simple, swift, and inexpensive in execution. The present law creates two offences: 1st., that of selling *knowingly* articles adulterated with substances injurious to health. It will generally be very difficult to prove that a tradesman knows that his cayenne is mixed with red lead, his pickles made green by copper, and his sweetmeats a compound of coloured poisons and plaster of Paris. But the second clause expressly states that "every person who shall sell, as pure and unadulterated, any article of food or drink which is adulterated or not pure, shall for every such offence pay a penalty not exceeding £5 with costs, and for a second, his name and residence may be advertised at his own expense in the newspapers." Purchasers have, therefore, only to ask for the pure article; and, if deceived, the remedy is to be found at the next magistrates court, provided the clear evidence can be given that the article produced before the court is the same that was purchased for pure in the shop. The constant discussion and investigation of the adulteration of food has produced a decided improvement, even without the aid of penal laws. Dr. Normandy bears testimony to the fact that London bread is much improved; in twenty-three samples submitted to him by the magistrates of Wandsworth, nine only contained alum. It must be remembered that the people of London have been so long accustomed to adulterated bread, that many object to the produce of pure flour, water, salt, and yeast. It is a great point that consumers are beginning to learn that cayenne need not be of a deep red, or pickles of a bright green. The moment the customer begins to inquire, the tradesman finds it his interest to cross-examine the traveller and the wholesale grocer. It is a mistake to imagine that adulteration is largely carried on by retail shops: the greater number of adulterated articles are manufactured expressly to answer a demand for something cheap. It is quite absurd to suggest, as Mr. Scott did, that the sale of coarse brown sugar should be prohibited; but it is very useful to make public—that it is cheaper to employ a fine white or light-coloured sugar to make cakes and puddings—colouring, if necessary, with burned sugar—than to use coarse, dark "foots," which are often positively injurious to health—that, out of upwards of sixty matters used for the ornamental adulteration of confectionery, "twelve or thirteen are active, powerful poisons; a like number are harmless, except in special cases of disease or morbid debility; while the remainder are more or less injurious to health." In speaking of the adulteration of butter, which is all but universal, the lecturer did not seem to be aware that it is largely carried on in the Dutch dairies, and that for this purpose a considerable quantity of English fat is regularly exported to Holland. The penal laws already enacted seem not far from sufficient. When the consuming public learn what they are now just beginning to learn —the value of unadulterated food—reform will follow rapidly. In the meantime, attempts at over-legislation and attempts to show death in every mouthful we eat and drink, will only retard real progress. Mr. Bodkin carried the sanitary mania to a climax, by suggesting that adulterated food had caused an increase in the number of pauper lunatics. We meet him on the foundation, and contend that the number of lunatics per cent. has not increased, but they are now sought out and shut up, instead of being left at large. Some good may no doubt be derived from the study of raw produce in economic museums, but hasty over-legislation must be resisted. Its most active promoters are medical men without patients, and in search of an office.

The condition of the English and Scotch agricultural labourer has lately been exciting a good deal of attention. The modern system of agriculture requires sharp, intelligent workmen, and there is not so much choice as before the railways began to carry them at a penny a mile; hence, an active movement for improving the cottages, the education, and the comforts of the field workman. It is a curious fact that, while in Scotland great farmers declare that the agricultural "hinds" have deteriorated in character, in the counties of Wilts and Gloucester inland, and Kent on the coast, we have it on undeniable authority that the labourers have much improved, are more honest, sober, and industrious, in spite of "the corrupting influences" of better wages, than they were forty years ago. It is still more curious to find that, while some philanthropists and politicians ask for the creation of numerous cottage farms as an improvement in our agricultural system, in France, where subdivision of property is carried to the utmost, and where machinery is scarcely used, the complaint of the want of labour, and of the constant stream of emigration to town, is louder than in this country, and accompanied by statements that the rural population does not increase! A correspondent of the *Journal d'Agriculture Pratique* declares that the depopulation of the rural districts is the question of the day, and attributes it to "domestic insubordination." "The father of the family has lost all authority over his children, and is no longer master at home. As soon as the sons become as strong as the father, they no longer obey him; and, as soon as they can excel him in work, they expect him to obey them." "The result is, they quarrel, and the sons fly to the towns." The evil appears so great, in the eyes of the writer, that he hints the necessity of a law, "investing the father with dictatorial powers, compelling the sons to live with and obey him." But the most extraordinary statement connected with the asserted disobedience and emigration of the young French peasantry, and bearing on the increase of the rural population, we give in the original, not daring to translate it:—"*Aussi, ne voit-on plus à la campagne que des familles réduits à leur plus simple expression: l'homme, la femme, à peine deux petits; car, une monstruosité en produisant une autre, le mari, sur de trouver dans sa géniture moins des auxiliaires que des maîtres,* assigne d'étroites limites à la fécondité de son lit. *Autre calamité agricole dont la nature est de se faire sentir de plus en plus, à mesure qu'on avancera dans l'avenir!*" A terrible picture, if true! The writer concludes by hoping to replace hand-work by agricultural machinery—hopes which have not been realized in this country, where the increased crops of improved machine-cultivation require more hands to gather and distribute amongst the increased live stock which must be fed on machine-cultivated farms.

REAPPEARANCE OF THE OIL-OF-VITRIOL BUGBEAR.

We have often had occasion to remark that certain questions which agitate and alarm the public mind seem to revolve in

cycles, and that after having had their fallacies exposed and been forgotten, their periods of revolution return, and they reappear and again occupy attention as if they had never been seen before and possessed the substantiality of truth. The oil-of-vitriol bugbear is one of these periodical hobgoblins that frighten timid men awhile from their propriety. It is no matter how effectually the ghost has been lain and the delusion exposed; it "revisits the glimpses of the moon" at its appointed time, and, though it may fail to "make night hideous," it endeavours to perpetuate gloom by alarming the consumers of gas. This hobgoblin first appeared in this country about seven years ago, when it was energetically supported and magnified by Dr. Letheby, who tried to create an oil-of-vitriol panic by showing—or rather by endeavouring to show—that each gas-burner emitted volumes of oil of vitriol; and that books and furniture were injured, and that the lungs inhaling the air so contaminated were destroyed. These phantoms of the learned Doctor's imagination were completely dissipated by the light of truth, which was thrown on them by some eminent chemists in the pages of this JOURNAL; and they vanished, as we vainly presumed, for ever. But five years afterwards, the same bugbear reappeared, again under the cloak of the same skilful magician, and once more threatened the world with its destructive ravages. Fortunately, the potent charms of Dr. Leeson and of Mr. Warington, supported by facts and superior skill, exposed the fallacy; and, after a bold attempt to prove that the destruction of books in public libraries was occasioned by oil of vitriol produced by the combustion of gas, the delusion was dispelled and disappeared. Now, again, at a much shorter interval, the sulphurous meteor has returned in its eccentric orbit, and we are again called on to tranquillize the public mind and to assure the consumers of gas that there is no danger.

On the present occasion, the Rev. W. Bowditch's new mode of purification appears to be the exciting cause of the visitation of the oil-of-vitriol apparition; and, curiously enough, it now presents itself with threatened destruction in one hand, and with the antidote in the other. Mr. Bowditch's paper on the purification of gas, read before the Royal Society, as published in our last number, has directed attention to the presence of bisulphide of carbon in coal gas; and his process of freeing gas from that impurity has reagitated the question whether the small quantity of bisulphide of carbon that has hitherto defied removal by any of the ordinary processes of purification, yields deleterious products during the combustion of the gas. The *Builder*, which takes credit for having originated and excited the movement for cheap and good gas, is highly laudatory of Mr. Bowditch's new process, and says, "The time appears to have at last arrived when we may confidently look for a vast extension of the use of cheap and good gas in private dwellings;" and it is asserted that the sulphur hitherto contained in gas has, far more than any other circumstance, prevented the general adoption of gas lighting. Our contemporary, in order to clench the latter opinion, adds, that the gas supplied by some of the companies is of a most unsatisfactory character, and the gas of one company is specially named as being "little less than a swindle." He seems to forget that there are some stringent provisions in the Metropolis Gas Act for maintaining the purity of the gas; and it is a curious fact that, while one professed agitator is thus indignantly complaining of the wretched quality of the gas now supplied by the London companies, another leading agitator, as we have elsewhere noticed, is affirming that its illuminating power is so much improved that four cubic feet give nearly as much light as five feet did before the passing of the Act.

It is well known to our readers, that we have combatted the morbid demand for absolutely pure gas as impracticable and useless. Some ammonia is required to prevent the deposition of naphthalin in the service-pipes and in the meters; and as by no known process hitherto available can gas be freed altogether from bisulphide of carbon, the presence of a further portion of ammonia is required to convert the sulphur, during combustion, into sulphate of ammonia, which is a harmless salt, instead of producing sulphurous acid, as it would otherwise do. Nevertheless, if by Mr. Bowditch's process, the remaining bisulphide of carbon can be removed without much difficulty on a manufacturing scale, there can be no doubt it would be a considerable improvement. The gas companies generally, as well as ourselves, are looking anxiously for its application in a large gas work; for, as Mr. Bowditch himself observed on a former occasion, when his cold clay and lime method of purification was in question, "no small scale experiments can satisfy the public."

In the meanwhile, as the presence of sulphur is again brought forward as an objection to the use of gas in private dwellings, it may be desirable to recapitulate briefly the evidence previously adduced to prove that the minute quantity of sulphur that remains in purified gas is not converted, during combustion, into any injurious product. The experiments of Dr. Leeson and of Mr. Warington, confirmed by those of Mr. Lewis Thompson, established the following facts;—That free sulphuric acid cannot be retained in a vaporous condition in the atmosphere at a lower temperature than 600° Fahr.; that sulphurous acid does not become oil of vitriol by absorption of oxygen from the atmosphere, and not even by exposure to pure oxygen gas; that the proportion of sulphur in gas as supplied by the metropolitan companies is infinitesimally small; that any sulphur contained in coal gas combines immediately during combustion with the ammonia that is always present in it, to form sulphate of ammonia, which is perfectly innocuous; and that the analyses of the vaporous products of the ordinary combustion of gas show the total absence of free sulphurous or sulphuric acid. More conclusive evidence of the absence of sulphur acids in the product of combustion could scarcely be conceived; but, as if to make assurance doubly sure, Mr. Lewis Thompson condensed the vapour of a room highly heated with gas, until he had collected as much as forty gallons of water, which he subjected to analysis. In the whole of that quantity, not a trace of free sulphurous or sulphuric acid was perceptible; the sulphate and the formiate of ammonia were present; but no trace whatever of free sulphuric acid. Even when the unpurified gas, as it issued from the retorts, and before it had passed through the condensers, was burned, the products were alike destitute of sulphur acids.

Recent analyses of the gas supplied by the London companies fully confirm those formerly made by Dr. Leeson and Mr. Warington, as regards the infinitesimally small quantity of bisulphide of carbon. Mr. Versmann, an able chemist, has been employed to analyze the gas of two companies, with a view to ascertain their proportions of bisulphide, and the results of his experiments were, that the gas of one company contained from 2·6 to 6·70 grains of sulphur in 100 cubic feet; and that of the other company from 8·40 to 10·43 grains. Taking the average of the experiments on the gas that contained the larger quantity of sulphur, we obtain the following results:—That 10,000 parts by weight of gas contain 3·8 parts by weight of sulphur; and that 10,000 cubic feet of gas contain considerably less than 1 cubic foot—viz., 0·747—of vapours of bisulphide of carbon. Looking at the relative products of carbonic acid and of sulphurous acid from the combustion of 100,000 feet of gas, the quantity of the former, which is nearly equally destructive of life, amounts to 50,000 feet, whilst the sulphurous acid occupies less than 15 cubic feet. In experiments by Dr. Hofmann in July, 1859, and in January, 1860, as reported to the Lords of the Privy Council on Education, the average amount of sulphur in 100 feet of gas varied from 7·54 grains in summer to 9·94 grains in winter, which are less than the quantity on which the preceding calculations are founded.

Mr. Versmann, for the purpose of showing more clearly how very small is the quantity of sulphur compounds produced by the combustion of gas, calculates that in a large, lofty room, lighted by four burners, each consuming 5 cubic feet of gas per hour, there would be no more sulphurous acid produced than by the ignition of ten lucifer matches. Still further to show the very trifling effects of burning gas that contains as much as 20 grains of sulphur in 100 cubic feet—which is the maximum quantity allowed by the Metropolis Gas Act—Mr. Versmann calculates that if 100 cubic feet of such gas were burned in a room containing 160,000 cubic feet of air, and without any ventilation, the atmosphere would not contain more than one cubic foot of sulphurous acid. That quantity, he further shows, by reference to Dr. R. Angus Smith's investigations "on the air of towns," is less than the average per centage of the same acid in the atmosphere of Manchester. It is evident, therefore, from these facts and figures, that were we to admit the reality of the spectre that has been raised to frighten us from burning gas, its form must be so attenuated as to be imperceptible to the most delicate organs of sensation. But, in the ordinary process of combustion, it cannot attain even that degree of

unsubstantiality, for it is seized, the instant it comes to the burner, by the ammonia, which lies *perdu* in the gas, and its character is so completely changed and mollified that it cannot be a bugbear to the most timorous of mortals.

Circular to Gas Companies.

The section of the gas-meter manufacturing trade which last year defeated the attempt then made to amend Lord Redesdale's Sale of Gas Act, threaten to oppose by every means in their power any further attempt to amend it, and have secured the co-operation of our contemporary, the *Observer*, which in its last number publishes an article on the subject, intended to mislead the public as to the real merits of the question. It charges the local metropolitan authorities with having neglected their duties by not appointing inspectors to carry the Act into operation, while the gas companies are represented as being anxious to repeal or shelve the Act altogether. The writer has apparently never read the Act, or he would have seen that it gives no power to any of the local authorities of the metropolis to appoint inspectors, except in the City of London, and that in this respect, at least, according to his own argument, the Act requires to be amended. As for the gas companies, they are as anxious as the writer that legislation should take place on the subject; but they desire that it should be equitable and not partial legislation, and that the instruments with which they are supplied should be the most perfect which ingenuity can devise. An enormous amount of not very creditable intrigue is at work to defeat any amendment whatever; but we have good ground for believing that, at an early period of the Session, a bill will be introduced of a character which will satisfy the just expectations of gas companies, and protect the public even more effectually than is provided for by the existing Act.

The Home Secretary has introduced a bill to amend the law with regard to parochial assessments in England. The bill has not yet been printed, so that we have had no opportunity of considering its details. He, however, stated that it was not his object to alter the present law in respect of rating, but to enforce a more accurate and uniform mode of assessment. He proposed to limit his measure to poor-rates and county-rates; and to create a board of county justices in the counties to be called the assessment board, and a similar board in boroughs to be appointed by the town council. His object was to assimilate the mode of assessing the county-rate and the poor-rate. The proposed transfer of jurisdiction in boroughs will, we apprehend, be found to work prejudicially to all who combine the positions of occupiers and owners of property, and the introduction of such a measure affords a favourable opportunity for placing the assessment of gas and water companies upon a more satisfactory footing than it at present stands.

The Bill of the Sowerby Bridge Gas Consumers Company, is to be read a second time this evening, and those of the London Tramway and Dispatch Company, the Huddersfield Gas Company, and the Sowerby Bridge Gas Company tomorrow evening, and most of the other private bills included in our list are duly progressing through the preliminary stages. The Birmingham Improvement Bill, and the Bill of the Dover Gas Consumers Company, are declared not to have complied with the standing orders. It does not, however, follow that they are definitively lost, as the standing orders committee may allow them to proceed, should they see fit.

We have always given Mr. Hughes credit for boldness and ingenuity in dressing up a case to serve the purpose of the day; but all his previous essays are surpassed by a new contrivance, whereby he hopes to make the payment of the expenses of the Metropolis Gas Act more palatable to the ratepayers. He is anxious to show that, by the operation of the Act, the whole sum assessed to pay for it, may be saved in a single year in the public lighting alone. Such a proposition, in the face of several considerable advances in the charge since the passing of the Act, may seem difficult to establish, but though to ordinary men it may so appear, to Mr. Hughes it is perfectly facile. His plan is simply to substitute four-feet burners for the five-feet burners now generally used, and by that means, it is quite clear a saving of nearly one-fifth may be effected. It may be objected, indeed, that what would be saved in money would be lost in light, and that the streets would be in comparative darkness. But Mr. Hughes contends that the increased illuminating power of the gas, since the Metropolis Gas Act was passed, will be sufficient to compensate for the difference. He does not deny that the companies now supply the full quantity contracted for; nevertheless, he asserts that the vestries and district boards are, every year, illegally overpaying the gas companies a larger sum than the whole cost of obtaining the Act. Not satisfied, however, with the saving to be directly effected by diminishing the quantity of gas consumed, he has in prospect a further reduction in the cost of public lighting by a new principle of settling the price by arbitration. He thinks it probable that the arbitrators will take into account the annoyance and loss occasioned to the public by removing the pavement to lay down mains and service-pipes; and that, in opposition to the provisions of the Act, they will determine that local authorities are entitled to a supply of gas at a reduction of fully 25 per cent. on the charge to private consumers. Mr. Hughes illustrates his assertions by a table of figures, showing the number of lamps, the prices paid, and the prices that ought to be paid; and in one column is shown the totals paid in excess, which, in the twenty-four parishes which he selects, amount to £6113. We very much question whether this notable scheme of saving money by darkening the streets will meet with favour from the public. In the parish of Marylebone the illuminating effect of 4-feet burners may be seen; and, were it not that the lamps are placed more closely together, the darkness would not be tolerated. That parish is excluded from Mr. Hughes's list; but, as the feebler light of each lamp is compensated by greater number, his principle of reduction, if good for anything, should be equally applicable there.

The St. James's vestry, if we may judge from a report of their proceedings in the local paper, are true to the adage that a prophet has no honour in his own country, for they are stated to have again handled Mr. Hughes somewhat uncourteously. On the presentation of a report from him, relating to the fixing of meters to the public lamps, one of the vestrymen is stated to have said, that the less they had to do with Mr. Hughes the better, and he was not alone in that opinion. A motion for fixing the meters as recommended was, however, agreed to; and we confidently predict that the effect of Mr. Hughes's recommendation will be to prove the fallacy of his assertions of deficiency in the supply of gas to the street lamps.

The formation of the Universal Lime-Light Company, and their application to Parliament for an Act authorizing incorporated gas companies and other bodies supplying gas, to enter into contracts for the use of their various processes, has drawn attention to the question of the manufacture of oxygen, and has induced us to translate a paper on the subject which appeared in the January number of the *Annales de Chemie et de Physique*, containing much valuable information as to the cost of obtaining oxygen from the various substances hitherto used in its manufacture, including manganese, chlorate of potash, chloride of lime, nitrate of soda, nitrate of baryta, binoxide of barium, sulphate of zinc, and sulphuric acid. We are only able to give a part of the paper in our present number, but in the latter portion, the writers describe a process by which sulphuric acid is decomposed at a nascent red heat into sulphurous acid and oxygen, which gas, by this process, costs only 15*s.* per 1000 cubic feet, or about one-seventh of its cost when prepared from manganese. It may also be manufactured at a cheap rate from the sulphate of zinc, a waste product of voltaic batteries, but the quantity of this material to be obtained must be too inconsiderable to warrant its being looked to as a permanent source of supply. If the sulphuric acid process is found to be easy and safe in its manipulation, the oxy-hydrogen lime-light may possibly be advantageously adopted where powerful lights are required.

Register of New Patents.

1752.—John Stenhouse, of 11, Upper Brunswick Terrace, Barnsbury Road, London, chemist, for "*Improvements in purifying coal gas.*" Provisional protection only obtained. Dated July 19, 1860.

This invention consists in purifying coal gas from bisulphuret of carbon, by treating the gas with spirits of wine (the ethylic alcohol of chemists), or with wood spirits (the methylic alcohol of chemists), or with fusil oil (the amylic alcohol of chemists). The solutions of potash, soda, and ammonia, with their sulphurets and carbonates, dissolved in the before-mentioned alcohols, are also employed, either singly or in combination. To these alcoholic solutions are likewise added rectified coal tar, naphtha, the oils of coal tar, and any other suitable liquid hydrocarbons, or essential and fixed oils. The gases are treated with these liquids by means of the well-

known apparatus called a washer, or any other suitable mechanical arrangement. The bisulphuret of carbon is dissolved by these liquids, forming the well-known series of acids—viz., the xanthic, the xanthomethylic, and xanthamylic; and, if alkaline bases are present, corresponding salts of these acids, containing potash, soda, and ammonia, are produced.

When these liquids have ceased to absorb, or are become saturated with bisulphuret of carbon, they are removed from the apparatus; and, by cautious rectification, advantage being taken of the difference in volatility of the alcohols and bisulphuret of carbon, these substances are separated from each other, and thus the greater portion of the spirits and bisulphuret of carbon are recovered.

When alkaline solutions are employed, it is necessary to neutralize the alkalies with acids before beginning to rectify, and in this manner the greatest portion of the alkali is also recovered.

1779. — George Henry Birkbeck, of 34, Southampton Buildings, Chancery Lane, London, for "*Improvements in the construction of chimneys for lamps, or apparatus for transmitting light.*" A communition from M. Etienne Soulie, of Paris. Patent dated July 23, 1860.

This invention has for its object the construction of the chimneys of lamps, or apparatus for transmitting light, partly of metal and partly of glass, mica (talc) crystal, or other transparent or diaphonous substance. For this purpose, the upper and lower portions of the chimney of a lamp, or other apparatus employed for transmitting light, is formed of any suitable metal not liable to be melted by the heat from the lamp, the upper and lower parts of such chimneys being connected together by narrow metallic rods or connexions opposite to the flame of the lamp, so as not to intercept the light; and the space between the upper and lower parts of metallic chimneys, constructed according to this invention, is closed up, or formed of glass, mica (talc), or other suitable transparent substance, which may be of tubular or other form, in one or more parts, and supported on a suitable ring or gallery on the lower part of the body of the matallic chimney.

1790.—William Bruimer, of Printing-House Square, and William Hall Levett, of Clare Street, Lincoln's Inn Fields, London, for "*An improved apparatus for increasing the illuminating power of coal gas; also for economizing the consumption thereof, and for regulating the pressure from street mains.*" Provisional protection only obtained. Dated July 24, 1860.

This invention relates to improved apparatus for effecting the abovementioned objects in a more certain and efficient manner than heretofore, and consists in constructing the said apparatus in the following manner—that is to say, the case of the apparatus may be constructed of metal, earthenware, or other material, and may be of any desired shape. Within this case, it is proposed to arrange fixed partitions or divisions across either way of the said case, or round the interior, or a portion thereof, so that the gas that enters the apparatus is compelled to pass through over or under, or to enter at either side of the said series of partitions. These partitions may be composed either of cotton, wool, flannel, felt, drugget, sponge, or other fibrous or absorbent material or substance, either separately or two or more combined together. It is further proposed to adapt, at one or both sides of each of the said absorbent partitions, another partition, formed either of perforated metal, parchment, skin, hide, or other similar substance, perforated for the purpose of diffusing the gas over the absorbent partitions, as aforesaid.

The apparatus thus constructed is to be either partially or wholly filled with a spirit of oil, such as benzole or naphtha, or a mixture of benzole and naphtha, or any other spirit that will increase the illuminating power of the gas.

No claim is made to the use of benzole or of any other spirit or oil, but simply to the apparatus above described, in which the same may be employed.

1796.—Eugène Hédou, of 2, Rue Sainte Appoline, Paris, and 4, South Street, Finsbury, London, for "*Improvements in the manufacture of "tar paper," which improvements may also be applied to several other uses.*" Provisional protection only obtained. Dated July 25, 1860.

Hitherto, tar paper has been made with old ropes and cloth containing tar, after being suitably worked and reduced to a pulp, which mode of manufacture presents various defects. This invention has for its object to obviate such defects, and consists in employing a pulp made of any suitable material, and afterwards treating the same with a tarry liquid or composition prepared as hereinafter described.

The tarry composition is prepared by boiling, for instance, about 11 gallons of tar with the same quantity of vegetable glue, as employed in the manufacture of paper. After three hours boiling, about 6½ gallons of boiling water are poured into the mixture, which is then well mixed together, and boiled for five minutes.

In a vessel of suitable size, and holding about 130 gallons of water, are placed 110 pounds of potato or other suitable flour, taking care to saturate it completely; which done, the tar dissolved with vegetable glue is poured into the vessel with 33 gallons of boiling water. The whole is well stirred till the tar becomes incorporated with the flour and forms a tarry composition, which may be used in the proportion of 27 gallons per 220 pounds of paper pulp. The paper, thus prepared, may be coloured or shaded and varnished on one side, as required. The tar dissolved with the vegetable glue may be employed for tarring, and for preparing various substances to increase their duration, such as ropes and cords, sail cloth, tent covers, and other articles; wood, for ships, and other uses. This application may be made either in the hot or cold state, and under strong pressure from a pump or hydraulic press.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED INVENTIONS.

80.—William Henry Moran, of Cologne, for "*Improvements in gas-meters.*" Jan. 11, 1861.

82.—Alphonse Réné Le Mire Normandy, of Odin Lodge, King's Road, Clapham Park, Surrey, for "*Improvements in connecting gas and other pipes.*" Jan. 11, 1861.

110.—Joseph Willcock, of 89, Chancery Lane, London, patent agent, for "*Improvements in gas-regulators.*" A communication. Jan. 15, 1861.

221.—Herbert William Hart, of 3, Rue Bergère, Paris, gas-engineer, for "*Improvements in gas-burners.*" Jan. 28, 1861.

NOTICE HAS BEEN GIVEN OF INTENTION TO PROCEED WITH THE UNDERMENTIONED INVENTIONS.

2491.—Mary Strang, otherwise Hutchison, of Glasgow, N.B., widow, executrix, *dative qua* relict of George Hutchison, sometime merchant of the same place, for "*Improvements in the manufacture of lubricating oil.*" Oct. 13, 1860.

3162.—Charles Lizars, of 36, Rue Lafayette, Paris, manufacturer of gas-meters, for "*Improvements in gas-meters.*" Dec. 26, 1860.

56.—Edward Clarence Shepard, of Victoria Street, Westminster, for "*An improved apparatus for carburating gas for gas-lighting.*" Jan. 9, 1861.

82.—Alphonse Réné Le Mire Normandy, of Odin Lodge, King's Road, Clapham Park, Surrey, for "*Improvements in connecting gas and other pipes.*" Jan. 11, 1861.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2529.—John Sweet Willway, "*An improved apparatus to act as a gas-valve.*" Oct. 2, 1857.

2562.—James Stoneham, "*Improvements in uniting or connecting piping.*" Oct. 6, 1857.

2564.—William Knapton, "*Improvements in gasometers or gasholders, and in the application thereof to railway and other carriages and ships, for lighting the same with gas.*" Oct. 6, 1857.

2587.—Fennell Herbert Allman, "*Certain improvements in the construction of valves and taps.*" Oct. 9, 1857.

2660.—Richard Archibald Brooman, "*Improvements in forming the joints of pipes for conveying water, gas, and other fluids.*" Oct. 17, 1857.

2727.—John Addison, "*Discovering and destroying hydrogen or carburetted hydrogen gas and other gases in coal mines, dwelling-houses, or other places.*" Oct. 28, 1857.

2794.—Anthony Charles Sacre, sen., "*An improved apparatus for measuring water.*" Nov. 3, 1857.

2822.—John Fordred, "*Improvements in treating and purifying water.*" Nov. 7, 1857.

2836.—William Devon, "*An improved self-acting apparatus for flushing water-closets, and the means of connecting the same to water-mains, parts of which are applicable to the junction of gas or water-pipes generally.*" Nov. 10, 1857.

2885.—Richard Archibald Brooman, "*Improvements in gas-burners.*" Nov. 17, 1857.

2959.—William Elcock, "*Improvements in elbows used for joining wrought-iron and other pipes or tubes, and in tools for manufacturing the said elbows.*" Nov. 27, 1857.

2982.—James Young, "*Improvements in measuring liquids.*" Dec. 1, 1857.

2985.—Denny Lane, "*Improvements in lighting, regulating, and extinguishing street and other gas lamps by means of electricity.*" Dec. 1, 1857.

2986.—Thomas Jefferson Thompson, "*Improvements in apparatus for lighting railway trains with gas.*" Dec. 1, 1857.

3004.—William Parsons and James Attree, "*An improved cock or tap and flushing apparatus.*" Dec. 3, 1857.

3041.—Richard Archibald Brooman, "*Improvements in cocks and valves, for regulating the flow of fluids.*" Dec. 8, 1857.

3127.—William Thrift and Adam High, "*An improved self-acting ship's water-closet.*" Dec 21, 1857.

3131.—Francis Taylor, "*Improvements in closets or privies.*" Dec. 21, 1857.

3173.—James Wadsworth, "*Improvements in the production and management of artificial light, and in apparatus applicable thereto.*" Dec. 2 1857.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

2435.—Jean François Felix Challeton, "*Certain improvements in carbonizing and distilling peat, coal, wood, and other animal, vegetable, and mineral substances.*" Oct. 21, 1853.

2899.—John Luill Kay, "*Improvements in gas-meters.*" Dec. 14, 1853.

2939.—George Anderson, "*Improvements in apparatus used when manufacturing gas, which apparatus, or part of which, is also applicable when transmitting gas from one place to another.*" Dec. 17, 1853.

2997.—Frederick Crace Calvert, "*Improvements in the treatment of naphthas and other volatile hydrocarbons, and in the application of the same to various useful purposes.*" Dec. 27, 1853.

3002.—John Parkinson, "*Improvements in governors for regulating the pressure of steam, gas, and other fluids or liquids.*" Dec. 28, 1853.

Parliamentary Intelligence.

HOUSE OF LORDS.

FEB. 8, 1861.

The Lord Chancellor reported to the House that the Standing Orders applicable to the following bills have not been complied with:—Bolton Corporation, Blackburn Water, Birmingham Improvement, and Hastings Western Water.

HOUSE OF COMMONS.

FEB. 6, 1861.

Bolton Corporation.—The Examiner reported that the Standing Orders have not been complied with.

FEB. 7, 1861.

SOWERBY BRIDGE GAS CONSUMERS.—Bill read the first time, and ordered to be read a second time.

DEWSBURY, BATLEY, and HECKMONDWICKE WATER.—Bill read the first time, and ordered to be read a second time.

DUBLIN CORPORATION WATER.—Bill read the first time, and ordered to be read a second time.

FEB. 8, 1861.

BIRMINGHAM IMPROVEMENT.—The EXAMINER reported that the Standing Orders have not been complied with.

LONDON TRAMWAY and DISPATCH.—Bill read the first time, and ordered to be read a second time.

HUDDERSFIELD GAS.—Bill read the first time, and ordered to be read a second time.

SOWERBY BRIDGE GAS.—Bill read the first time, and ordered to be read a second time.

PAROCHIAL ASSESSMENTS.—Bill read the first time, and ordered to be read a second time.

HIGHWAYS.—Bill read the first time, and ordered to be read a second time.

Legal Intelligence.

VICE-CHANCELLOR'S COURT.

(*Before Vice-Chancellor* WOOD.)

FRIDAY, JAN. 25.

THE BIRMINGHAM WATER-WORKS COMPANY *v.* THE LONDON AND NORTH-WESTERN RAILWAY COMPANY.

Mr. ROLT (with whom was Mr. CHAPMAN BARBER), appeared for the plaintiffs in this case, and said he had to ask for an injunction to restrain the defendants from entering upon, taking, or using, either temporarily or permanently, any of the lands in the bill mentioned, unless with the consent, in each instance, of the plaintiffs, under their common seal; or from carrying on any works upon any part of the bed of the River Tame. The plaintiffs were the owners of lands in the neighbourhood through which the line ran, and they had also a title to the lands covered with water, in a portion of the river. The question between the parties was the right of the railway company to cross the river with arches, which would require the building of piers in the bed thereof. The building of those piers would be very prejudicial and injurious to the water-works company, who contended, upon the construction of their Act, that the defendants had no right to build them, but that they must construct a viaduct, which would cross the river without interfering with its bed at all, except with consent of the water-works company. The Act of Parliament under which the railway company was incorporated for this purpose, was called "The London and North Western Railway Sutton Coldfield Branch Act, 1859."

The VICE-CHANCELLOR: Does the question turn upon the general clause about "viaducts?"

Mr. ROLT: That will be important. The clause in the Act protecting the interests of the water-works company required that the railway company should do no damage to the reservoir or works of the water-works company; nor, except for the purpose of constructing a railway with not more than a double line of railway, and without sidings, or other collateral works, enter upon, take, or use, either temporarily or permanently, any of the lands or property of the water-works company, unless with their consent. On the 7th of November, 1860, the plaintiffs were served with notice from the defendants that they required to purchase and take, by virtue of the Act, and for the purposes of the works authorized thereby, certain pieces or parcels of land covered with water. A plan was annexed to that notice, by which it appeared that the river Tame was intended to be crossed by arches. Then communications took place between the companies, and the water-works company were advised that the railway company had no right to erect piers in the river. The plaintiffs, having subsequently been informed that the defendants had applied to the justices for an order authorizing them to commence the erection of the piers, were obliged to come to the court for an injunction. According to the deposited plans, it was not shown that the viaduct which it was proposed to make would cross the river by arches; and the learned counsel contended, upon the effect of the Railway Clauses Act that, unless it could reasonably be inferred from the construction of the Act, and that which was referred to in the Act, that piers were intended to be put in the bed of the river, the railway company had no right to put them there. The defendants, however, argued that there was a standing order of the House of Commons which rendered it unnecessary for them to show in their deposited plans that the viaduct by which they proposed to cross the river would be erected upon arches. The whole question was, whether anybody looking at the plan could be expected to know that it was intended to build piers in the river; for, if not, there was an end of the case? No doubt a viaduct might be erected upon arches. No doubt, also, it did not necessarily follow, because a viaduct was to be made, that there would be one arch the whole way. It was a matter perfectly familiar to everybody, that a viaduct might very well be made without arches; and the deposited plans, not showing those arches, the plaintiffs contended that the defendants had no right to build piers in the bed of the river. The words of the 13th section of the Railway Clauses Act were to the following effect:—"Where in any place it is intended to carry a railway upon an arch or arches, or other viaduct, as marked upon the said plan or section, the same shall be made upon an arch or arches, or other viaduct so marked upon the said plan or section accordingly; and, where a tunnel is marked upon the said plan or section as intended to be made at any place, the same shall be made accordingly, unless the owners, lessees, or occupiers of the land upon which it is to be made shall consent that the same shall not be so made." Therefore, consent had nothing to do with a viaduct, but it must be made according to the plan or section; but, if it is delineated as being upon an arch or arches, that delineation must be followed. If it is to be done by "other viaduct," that must be followed; and the question came to the plain meaning of the English language—what did it convey to the mind of any one? The learned counsel submitted that, upon the plan and the language used, it meant a viaduct of sixty yards, without arches. Mr. Rofe, who was the engineer to the water-works company, had made an affidavit stating that the deposited plans led him to suppose that the company intended to cross the river without interfering with the bed or soil thereof; that he was in frequent communication with the surveyor of the line previously to the passing of the Act, and no mention was made to him of piers. The first time he heard of it was in the month of September last; and, in October, the surveyor of the railway company sent a plan to him for his approval. He subsequently informed the railway company's surveyor that he could not consent to it; because, in order to carry out the railway company's intended operations, it would be necessary to divert the river for the time being, and the purity and supply of the reservoir would be greatly interfered with. Beyond the injury done in the execution of the works, Mr. Rofe was of opinion that, by putting down the piers, the water-course of the river would be so much narrowed as to produce a scouring action upon the bed; that the water would thereby be frequently rendered thick and muddy at the very point at which it was most desirable it should be pure and undisturbed; and the power of taking pure water from the river would be greatly lessened, if not wholly destroyed. Mr. Baker, who was the engineer of the defendants, had made an affidavit, in which he stated it was always intended by the railway company to construct the viaduct upon arches; and, the river Tame not being a navigable river, the arches were not shown, because by the standing orders of the House of Commons, when it was intended to cross a river that was not navigable, it was not necessary to show the arches by which it was intended that the river should be crossed.

SATURDAY, JAN. 26.

Mr. ROLT: In the case of the *Birmingham Water-Works Company* v. *the London and North Western Railway Company*, I should tell your honour that, after the court rose yesterday, the parties conferred together; and I have proposed a meeting on Wednesday, in the hope of a settlement of the matters in dispute between the parties.

The VICE-CHANCELLOR: It will stand for the seal.

Mr. ROLT: I will not say the seal, because, if there was any urgency, I should ask leave to bring it on Wednesday.

THURSDAY, JAN. 31.

Mr. ROLT, to-day, resumed his argument upon this motion, owing to the parties not having been able to come to any arrangement. Having recapitulated the main points of his argument on the former occasion, he referred to the following words in the Act of Parliament:—"And all other works for or incident to the construction of the railway to be made under the direction and to the reasonable satisfaction of the engineer, for the time being, of the water-works company, and according to plans to be submitted to and approved by him, previously to the commencement of such works."

Sir HUGH CAIRNS said, in point of fact, the railway company had submitted plans of the proposed works to the water-works company's engineer: and, in fact, they had been approved.

Mr. ROLT would satisfy his honour that that was not so; and he read the affidavit of the engineer of the water-works company, who denied the fact of approval by him of the works as proposed. The learned counsel also relied upon the words in the Act—"The company shall do no damage to the reservoirs or works of the water-works company, unless with their consent." Did the proposed works do or not do damage to the reservoir? Was not the flow of water close to the reservoir? and, if any damage would be done to it by the proposed works, and the railway company could avoid that damage by adopting some other mode, they were bound to do so. He desired it to be understood, upon the question of compensation that, although the water-works company were willing, if possible, to meet the views of the defendants, yet no compensation would satisfy the water-works company so well as having the proposed viaduct constructed, without interfering with the bed of the river.

Sir HUGH CAIRNS said the water-works company had offered to take £1250 as compensation.

Mr. ROLT was aware of that: but the water-works company desired to have the works constructed according to the Act of Parliament, without "doing damage to the reservoirs or works of the company," and the plaintiffs insisted upon their right to have the viaduct so constructed. Again, the Act contained this provision:—"Except as in this Act otherwise expressly provided, nothing herein contained shall prejudice, alter, diminish, or take away any of the rights, powers, privileges, or authorities, of the water-works company." Was there or not a "right" and a "privilege" in the company with respect to the use of this water? Was it "expressly provided" that the railway company should construct a pier upon the land that was covered with water? It was not "expressly provided." It was "expressly provided" that there should be a viaduct; and it was clear that that viaduct might be made without interfering with the bed of the river. It was also clear that the Act of Parliament intended it to protect the water rights of the water-works company to the utmost extent; and, upon all these grounds, the plaintiffs were entitled to the injunction as prayed.

Mr. C. BARBER followed on the same side, and urged upon his honour that there was no suggestion on the part of the railway company that there would be any difficulty in crossing the river, by means of a girder bridge; but it was a question of expense, and the insertion of piers in the bed of the river would be somewhat less expensive; but he contended that the water-works company whose rights would be interfered with by the carrying out of the works as proposed, were entitled to the injunction which they asked the court to grant.

Sir Hugh Cairns and Mr. Speed, the counsel for the defendants, the railway company, were not called upon.

The VICE-CHANCELLOR said: The first question was, what was the meaning of inserting a limitation at all in the plan and book of reference? The reason, of course, for doing that was, to bring it within the operation of the clause, which authorized the defendants to enter upon, take, and use such of the lands as were required for the purposes of the undertaking. In the deposited plans and book of reference, the portion of the Tame proposed to be crossed was delineated and numbered, and it was, therefore, liable to be taken for the purposes of the line. The question then arose, how far this right was limited by the clause which gave protection to the water-works company? He was of opinion that the railway across the river Tame was intended to be confined to a double line of rails, without sidings or collateral works, without the consent of the water-works company; but, with respect to the viaduct, it was by no means necessary that it should be constructed with one arch only: but, on the contrary, the employment of several arches was rather to be inferred. It might be asserted to be a hardship upon the water-works company, who said they had been misled, because the company had simply stated "viaduct;" and the argument upon that was, that it meant only one arch; but, as his honour had before stated, he did not attribute much weight to that argument. Then, as to the point made concerning the words, "shall do no damage to the reservoirs or works of the company," they must be on a legitimate construction. His honour did not consider that those words applied to temporary damage, which he thought was all that would arise. There was evidence as to permanent damage, and it was said that, with an obstruction of the water-way to the extent of 10 feet out of 90, the scour would be so much increased as to be highly prejudicial. His honour thought much could not be made of that evidence.

Then, as to the contention that the plans must be submitted to the water-works company's engineer for approval; that, again, must receive a reasonable construction. The plans were to be submitted to the engineer for any reasonable suggestion by him, in order to provide for as little injury as possible to the water-works company; but this did not imply that the railway company were to be prevented from doing that which the Act authorized them to do; and the motion must, therefore, be refused with costs

COURT OF QUEEN'S BENCH.

TUESDAY, JAN. 22.

(Sittings in Banco, before Justices WIGHTMAN, CROMPTON, *and* HILL.)

DIXON *v.* FAWCUS.

The plaintiff in this action is a manufacturer of fire-bricks, and had been induced by the representations of the defendant to supply him with a large quantity of those goods marked with the name of "Ramsay." This being an infringement of the trade-mark of another manufacturer, a bill in Chancery for an injunction was filed against the plaintiff, who compromised the claim of Mr. Ramsay by the payment of £160 and costs of action. He now sued the defendant to recover that amount. The case came before the court on demurrer, the defendant's points being—that the declaration disclosed no cause of action, that it did not state that the defendant was guilty of any fraud upon the plaintiff, nor that the defendant had agreed to indemnify, or was bound to indemnify, the plaintiff against the consequences of his marking bricks as directed by the defendant.

Mr. MANISTY, Q.C., with Mr. J. E. CHITTY, appeared in support of the demurrer, and Mr. HINDMARCH for the defendant.

The declaration alleged that plaintiff was a manufacturer of fire-bricks, and that, before the committing of the wrongful acts, plaintiff, at the request of defendant, agreed with the defendant that the plaintiff would manufacture, and sell, and deliver divers large quantities of fire-bricks to defendant; and that all fire-bricks supplied by the plaintiff to the defendant should be marked in such manner as the defendant might direct; that, after the making of the said agreement, defendant wrongfully, deceitfully, and injuriously, and contrary to his duty on that behalf, directed that divers fire-bricks, to be manufactured, sold, and delivered by the plaintiff to the defendant, in pursuance of the said agreement, should be marked with the name or word Ramsay in manner following; that is to say, "Ramsay," he, the defendant, then well knowing, as the fact was, that George Heppel Ramsay, before, and at the time of the committing by the defendant of the wrongful acts herein mentioned, had been and was a manufacturer of fire-bricks, and exercised and carried on the business of manufacturing fire-bricks, to wit, at, &c., and had been and was accustomed to manufacture and sell fire-bricks marked with the name or word Ramsay, in order to indicate that the fire-bricks by the said G. H. Ramsay manufactured and sold were fire-bricks manufactured and sold by him, the said G. H. Ramsay, and also to distinguish the said fire-bricks from fire-bricks manufactured and sold by other persons. That at the time when the defendant directed the plaintiff to mark in manner aforesaid fire-bricks, so to be manufactured, sold, and delivered by the plaintiff to the defendant as aforesaid, he, the defendant, well knew that such fire-bricks, when sold and delivered by the said plaintiff to the defendant, would counterfeit, imitate, and resemble fire-bricks manufactured, marked, and sold by the said G. H. Ramsay, in manner aforesaid, and that he, the plaintiff, by manufacturing and marking such fire-bricks in manner aforesaid, and selling and delivering the same to the defendant, would render himself, the plaintiff, liable to have legal proceedings, commenced, taken, and prosecuted against him, the plaintiff, for so manufacturing, marking, and selling such fire-bricks, and also for the said G. H. Ramsay to obtain an injunction against the manufacturing and selling of fire-bricks marked in manner aforesaid by the plaintiff, and also liable to pay the amount of such damages as aforesaid to the said G. H. Ramsay, and defendant then wrongfully and fraudulently intended that the said fire-bricks which he, the defendant, so directed the plaintiff to manufacture and mark in manner aforesaid, and deliver to the defendant as aforesaid, should in fact, when manufactured and marked, and sold and delivered to the defendant, counterfeit, imitate, and resemble fire-bricks so manufactured, marked, and sold by the said G. H. Ramsay as aforesaid, so that he, the defendant, might and should be enabled wrongfully and fraudulently to sell the said fire-bricks so to be by the plaintiff manufactured and marked, and sold and delivered to the defendant as aforesaid as and for fire-bricks manufactured by the said G. H. Ramsay. That the said plaintiff, being ignorant of the said manufacture and sale of fire-bricks by the said G. H. Ramsay, as aforesaid, and being also ignorant that the said G. H. Ramsay had manufactured, marked, and sold fire-bricks in manner aforesaid, and also being ignorant that the manufacturing and marking of fire-bricks, in pursuance of and according to the said direction of the defendant, and the selling of such fire-bricks to the defendant, would be wrongful, or would render him, the plaintiff, liable to such legal proceedings, and to pay such damages as aforesaid, did, in pursuance of and according to the direction of the defendant, manufacture divers large numbers of fire-bricks for the defendant, and to be sold and delivered by the plaintiff to him, the defendant, in pursuance of the said agreement; and the plaintiff, being so ignorant as aforesaid, did in pursuance of the said direction of the defendant, mark each of the same fire-bricks by him so manufactured with the said name or mark Ramsay, by the defendant so directed to be marked thereon, and such fire-bricks by the plaintiff so manufactured and marked in pursuance of the said directions of defendant did, in fact, counterfeit, imitate, and resemble fire-bricks by the said G. H. Ramsay manufactured and marked, and sold as aforesaid; and the plaintiff says that the plaintiff being so ignorant as aforesaid, did sell and deliver to the defendant divers large quantities of the said fire-bricks by him the plaintiff so manufactured and marked in manner aforesaid, in pursuance of the said directions of the defendant as aforesaid; and the plaintiff further says, that by reason and means of the aforesaid wrongful acts of the defendant, and the several premises aforesaid, and by reason of the plaintiff acting in manner aforesaid, at the request of and by the direction of the defendant, and not otherwise, he, the plaintiff, by manufacturing and marking fire-bricks in manner aforesaid, and selling and delivering such fire-bricks to the defendant, as aforesaid, became and was liable to have legal proceedings commenced, taken, and prosecuted against him, the plaintiff, by and at the suit of the said G. H. Ramsay, to recover damages against him, the plaintiff, for and by reason of the plaintiff so manufacturing and marking the said fire-bricks in manner aforesaid, and selling and delivering the same bricks so marked to the defendant, as aforesaid, and also for the said G. H. Ramsay to obtain an injunction against the manufacturing and selling of fire-bricks marked in manner aforesaid, and also liable to pay the amount of such damages as aforesaid to the said G. H. Ramsay. And the plaintiff further says, that afterwards, and after the plaintiff had delivered divers of the said fire-bricks by him manufactured and marked in the manner aforesaid, and by him the plaintiff sold to the defendant, as aforesaid, and whilst he, the plaintiff, had in his possession some others of the fire-bricks by him so manufactured and marked, in pursuance of the said direction of the defendant, as aforesaid, the said G. H. Ramsay filed his bill of complaint in the High Court of Chancery, praying that he, the plaintiff, might be restrained by perpetual injunction, and in the meantime, by the order and injunction of the said Court of Chancery, from stamping, or marking, or causing or allowing to be stamped or marked any fire-bricks, manufactured by or for him with the name or mark of "Ramsay," or with any other name or mark so contrived or expressed as by colourable imitation, or otherwise, to represent the fire-bricks manufactured by the plaintiff to be the same as the fire-bricks manufactured by the said G. H. Ramsay, and also from selling or offering for sale, or procuring to be sold, or otherwise parting with or disposing of any fire-bricks heretofore manufactured by or for him, the plaintiff, and stamped or marked with the said name or mark Ramsay, or with any such other name or mark as aforesaid. And also that an account might be taken of all fire bricks theretofore manufactured and sold by the plaintiff, with the said name or mark Ramsay stamped thereon, and of the gains or profits made thereby by the plaintiff, and that the plaintiff might be decreed to pay to the said G. H. Ramsay the amount of such gains and profits. And the plaintiff further says, that thereupon, and in order to obtain a settlement and compromise of the claim of the said G. H. Ramsay against him, the plaintiff in the said suit, for such gains and profits as aforesaid; and to satisfy the claim of the said G. H. Ramsay for his costs and expenses in the said suit, the plaintiff was compelled to pay, and did pay, to the said G. H. Ramsay a large sum of money, to wit, £160, and was also compelled to pay, and did pay, divers sums of money for and in payment and satisfaction of the costs and charges of the plaintiff in and about his necessary defence in the said suit in the said Court of Chancery, amounting in the whole to a large sum, &c. The second count was similar in terms, alleging, further, that defendant knew that fire-bricks had been and were, by some person other than and except the plaintiff and the defendant, manufactured and marked with the said mark, "Ramsay."

The case for the plaintiff upon the demurrer was—First, that the fraudulent and deceitful direction of defendant to plaintiff as to marking the bricks to be made and sold in pursuance of the contract, and the damage which the plaintiff sustained by innocently obeying that direction, as stated in the declaration, furnish the plaintiff with a good cause of action against the defendant. Secondly, that the defendant's knowledge of bricks having been marked and sold, as mentioned, was sufficient to make him liable for the damage occasioned to the plaintiff by defendant's fraudulent direction. Thirdly, that the said counts show good causes of action.

Mr. MANISTY, in support of the demurrer, contended that no cause of action was shown. The defendant was innocent of fraud, as between himself and the plaintiff, and therefore was not liable in law. He submitted, on the authority of the case of *Rodgers v. Nowill*, (5 C.B., 109,) that there was no property in trade-marks. If there was no action at law, there was no suit in equity for an injunction, and Ramsay's remedy should have been against the present defendant.

Justice WIGHTMAN: There was damage, because the plaintiff had manufactured unsaleable bricks.

Justice HILL referred to the case of *Millington v. Fox*.

Justice CROMPTON asked whether there was any case decided against that; if not, the court must act upon it. Sitting there, they could not over-rule that case, which seemed, moreover, to have been decided in accordance with good sense.

Mr. HINDMARCH said there was another case to the same effect—that of *Blofield v. Payne* (4 B. and A., 410).

Mr. MANISTY said those cases were not now supported, and the case of *Farina v. Silverlock* was opposed to the authority of *Millington v. Fox*. Fraud was at the root of that case, which gave jurisdiction; and the present plaintiff must show that he was compelled to incur the damages which he now sought to recover.

Mr. HINDMARCH, for the plaintiff, was not called upon.

Justice CROMPTON: I am of opinion that our judgment should be for the plaintiff. The case of the highest authority is *Millington v. Fox*, and that case is distinctly in point, that an injunction in such a case would go. The question of costs is quite distinct. I do not think that the other case cited, *Farina v. Silverlock*, at all controverts the authority of *Millington v. Fox*. I do not know whether there might not be an injunction to prevent the parties carrying out this agreement; and, if so, it would go to the parties, their agents and servants; however, that is not necessary for the present purpose—it is sufficient that the damage incurred by the plaintiff was the natural effect of the circumstances stated in the declaration.

Justice HILL: I am of the same opinion. Here the plaintiff and defendant entered into an agreement, whereby the plaintiff was to make bricks, and defendant directed him to put on the bricks the name of Ramsay, who thereupon obtained an injunction, which was compromised by the plaintiff by the payment of £160. He now brings his action against the defendant to recover damages under these circumstances. I am of opinion that the plaintiff is entitled to recover. *Millington v. Fox* is a direct authority that a person who enables others to counterfeit the mark of a trader is liable to have an injunction granted against him. That is sufficient. Then, as to *Farina v. Silverlock*, the Lord Chancellor says, in that case—"The law is perfectly clear that any one who has adopted a particular mode of designating his particular manufacture has a right to say not only that persons shall not sell exactly the same article, better or worse, or an article looking exactly like it, but that they shall not sell in such a way as to steal (so to call it) his trade-mark, and make purchasers believe that it is the manufacture to which the trade-mark was originally applied." Again, his lordship says—"Once arrive at the point that the use of this label is an infringement of the plaintiff's right, and I quite agree with what the Vice-Chancellor has laid down, for this court would stop anybody from selling an article which should enable the perpetration of that fraud, just as it would stop the use of the label itself." It was not there alleged that the party had sold the labels as the labels of the plaintiff. In addition, I think that if the plaintiff has been plunged into expenses in consequence of these acts, he may regard them as special damage.

Judgment for the plaintiff accordingly.

MIDDLESEX ADJOURNED SESSIONS.

GUILDHALL, WESTMINSTER.—FRIDAY, FEB. 1.

(Before Mr. BODKIN, *Q.C., Assistant-Judge.)*

THE IMPERIAL GAS COMPANY, *Appellants;* THE PARISH OF PADDINGTON, *Respondents.*

Mr. J. CLERK with Mr. WOOLLETT and Mr. E. V. RICHARDS, appeared for the company; and Mr. DOWDESWELL and the Hon. G. DENMAN for the parish.

Mr. CLERK said he had the honour to appear in this case for the company,

in support of an appeal against a poor rate of the parish of Paddington, made on the 5th of April, 1859.

Mr. DOWDESWELL said he thought that, under the peculiar circumstances in which the respondents were placed, there would be some difficulty in going into the case at the present moment. He would briefly state to the court the position in which the parish were placed and the steps they had taken in the matter. When the company was first rated, Mr. Penfold applied to them, for the purpose of obtaining information as to statistics, and they refused to supply it. Upon several subsequent occasions, every kind of information was withheld; and, in fact, when the case was last year before the court upon appeal, Mr. Bovill stated that the company never would submit their books for examination, or give any assistance to the respondents on the subject. Under these circumstances, a case was subsequently presented to the Court of Queen's Bench, which was not argued; and another was drawn up, but not in such a form that this court could sanction. The company now, however, said that they were prepared to test this appeal upon the facts, and the parish had therefore again applied for permission to make the necessary examination of the books, and they were informed by Mr. Rees, the company's solicitor, that the vestry-clerk, and his clerk, were at liberty to do so. As it would have been useless to send those gentlemen for the purpose, the respondents employed Mr. Castle and Mr. Penfold, but as objection was taken by the company, Mr. Fuller, acting on his (Mr. Dowdeswell's) advice, went himself to their office to get as much information as possible. But immediately he applied for information, they told him they would show no books the entries in which related to any other part of the company's business than that which was connected with the parish of Paddington, or which extended to any other period than the year 1858. They moreover refused to show him the half-yearly balance-sheet of the company, so that the respondents were really not in a position, at the present moment, to go on with the case. They felt that they ought to have the means of investigating the accounts, and he thought it would have been a much more candid course for the company to adopt, had they been permitted to do so before coming into court. He was quite willing to hear the opening speech of his learned friend, Mr. Clerk, which would place them in possession of the existing state of things; but it would not be competent for him, without an inspection of the numerous books now in court, to carry the matter further at present, and contest the figures which the company might put forward. He thought the better course would be, after hearing Mr. Clerk's speech, to ask the court to adjourn the appeal, so as to allow the respondents the opportunity of inspecting the books at some convenient place; for, if this were not done, an enormous amount of time would be wasted. The company had refused to allow an inspection of their works, and had stated that they would appeal, from time to time, against the rating; so that it was desirable that, once for all, this litigation should be settled upon a basis that would be satisfactory to all parties.

Mr. CLERK said his lordship would recollect that, about three weeks previously, this day was appointed for the hearing of the appeal with the consent of his learned friend, Mr. Dowdeswell. Certain information was then sought from the appellants by the solicitor of the parish, and he (Mr. Clerk), had now before him a list of the questions proposed to the company by him, with their answers thereto. They included an account of the receipts for gas sold to private consumers in Paddington for the whole of the year 1859, the length and diameter of the pipes in the parish, the number of meters and service-pipes in the parish, the length and diameters of the mains out of the parish, the quantity of land upon which that portion of the works of the company stand which is used for the purpose of supplying gas to Paddington. All these items of information had been supplied by the appellants, and they also furnished the respondents with the company's annual total account for the year 1858, as made up for the clerk of the peace.

Mr. DOWDESWELL said the annual account was not what they wanted.

The ASSISTANT-JUDGE said the respondents could not complain of having what they asked for.

Mr. DOWDESWELL said it was not what they asked for.

Mr. CLERK said the more the company gave, the more the parish complained. The ground of his learned friend's complaint on the present occasion was, that he (Mr. Clerk) had risen for the purpose of conceding and arguing the case upon the very principle which the parish contended for. Everything which the respondents asked for, the appellants had given them information upon. True it was they asked to see the general account of the company's concerns.

The ASSISTANT-JUDGE: After you had given your answers?

Mr. CLERK: Yes. They said they wanted to see the general balance-sheet, which the company refused to allow, and for this reason—they were manufacturers of gas at three different stations, and were supplying different parts of the metropolis. They could not close their eyes to the fact that, since 1857, certain gentlemen had been most actively engaged on behalf of the parishes in discovering objections to the rating of different public companies in these parishes, and of finding out, not for the particular parish, but for other parishes, the means by which they could put on some exorbitant assessments, and thus force the companies to appeal to the sessions. Under these circumstances, the company refused to show Mr. Fuller, or anyone acting for him, their general balance-sheet, as it contained matters which did not in the slightest degree affect the rateable value of their property in Paddington. With respect to viewing their premises, the company had not the slightest objection; and, in fact, Mr. Castle and Mr. Penfold went over them a long time ago, and were as familiar with the state of them as the appellants were themselves. As to the inspection of the accounts, the respondents wrote to the company, at the time the hearing was fixed, asking to be allowed to examine them. The company said they had not the slightest objection; but, when the parish sent Mr. Penfold, with Mr. Castle, for the purpose, considering that Mr. Penfold, for whom, he might say, he had the greatest respect, had been, throughout all these cases, the zealous advocate of the parishes, it was not to be expected that the company would lay all their books before him, to enable him to make out a case in favour of this parish, or of any other. They said "send any fair impartial witnesses, and they shall examine the books." Mr. Fuller then wrote to say that, in appointing those gentlemen, he did not intend any affront to the company, and that the parish were most anxious to obtain a decision. As, however, he said, the company objected to a professional person attending to examine the books (which they certainly did not do, but only to those two gentlemen), he would do the best he could, with his own clerk, to elucidate the matter, and thus endeavour to save some trouble and expense in future investigations. From the time that letter was written, the 21st of January, to the present time, Mr. Fuller, the vestry-clerk, or any other impartial person, might have inspected the books.

Mr. DOWDESWELL asked whether his learned friend made the offer now that a professional accountant, an impartial man, might look over the books?

Mr. CLERK said the books were now in court for the purpose of examination, and the vestry-clerk, who was a solicitor, was fully competent to the examination of them. In fact, he had been to the company's offices, and gone through them; and he (Mr. Clerk), had no doubt that his learned friend had been instructed, as he certainly ought to have been, from the information thus obtained. Under these circumstances, the appellants came there with their witnesses, to fight the case on the day appointed for the purpose, having received no notice from the parish that they intended to apply to postpone it. He thought the course recommended by Mr. Dowdeswell, that the further hearing should be adjourned, after the appellants case was opened, a most inconvenient one; and he must request the court to allow the matter to proceed, as originally settled. With regard to the company refusing to show their accounts for 1859, he remarked that they were here to contest a rate made in April of that year; and a tenant for 1859 would base his calculations as to the rent he should pay for the company's property upon the previous balance-sheet of 1858. The demand to see the accounts for 1859 indicated a little the spirit in which Messrs. Castle and Penfold were about to investigate this matter; for how could it assist the parish, for the purpose of this rate, to know what the profits were in that year? It would be good evidence in reference to the year 1860, but could not possibly affect the rate of 1859.

Mr. DOWDESWELL said, the respondents asked for a detailed account for 1858, and the reply they got was—"I enclose a copy of the annual accounts made to the clerk of the peace under the company's Act. Is this the account asked for, it being the only annual account we make up? The accounts for our proprietors are made up half-yearly." Then the respondents asked for the half-yearly accounts, and these the company positively refused to show.

The ASSISTANT-JUDGE: Their annual accounts are the gross sums.

Mr. DOWDESWELL said they were. Afterwards, when Mr. Fuller attended, they refused to show him one single account for 1859. The reason why it was necessary that he should see those accounts was, that there was a balance carried on from 1858.

The ASSISTANT-JUDGE: The accounts for 1858 would show that.

Mr. DOWDESWELL said he was informed that they would not.

Mr. CLERK said even if they did not, he was instructed that Mr. Fuller saw that portion of the accounts of 1859, which did show it.

Mr. DOWDESWELL said the respondents required the inspection of the books, because it was an important consideration to know what portion, if any, of the expenditure had been charged to capital, and what to income. The note which Mr. Fuller made at the time the company refused to comply with his request was, "Half-yearly accounts refused us; also all accounts in any way mixed up with other parishes."

Mr. CLERK: What are you reading?

Mr. DOWDESWELL said it was the note made by Mr. Fuller at the time, and read over to the company's clerk—"where the specific account of Paddington, or in relation thereto, cannot be separately inspected." That was the gist of the whole thing—the expenditure of the entire concern—in order to extract that which referred to the respondent parish, there being many items of expenditure which extended over the whole works. But the appellants would not produce one of these accounts, and, under these circumstances, the respondents felt that they were helpless. It would, therefore, be only a waste of time to go into the matter now; it would not be satisfactory to the mind of the learned judge, and would certainly tend to promote litigation hereafter. On behalf of the parish, he would say that they only wanted the simple truth to be ascertained, in order that they might not rate the company at what they ought not to be rated. He would test the sincerity of the appellants, by inquiring whether they were now prepared to allow a professional man, other than Mr. Penfold, to go over the accounts?

Mr. CLERK said his learned friend had been misinformed upon one point. Mr. Fuller attended at the company's office from 11 o'clock till 5 one day, and their clerk and accountant offered to stay with him until 12 at night, if necessary. Every item of information asked for was supplied, and there was no concealment whatever, except that the accounts for 1859, and the general expenditure of the company at their other works, was withheld, as having no bearing whatever upon the issue in this case.

The ASSISTANT-JUDGE: Are the accounts kept distinct for each parish, or, in your statement, shall you put before us an apportionment, according to your own discretion?

Mr. CLERK said there would be no apportionment, except in reference to one item, which was the general charges of management. This was, of necessity, a matter of apportionment in every case, because one set of directors and staff of clerks managed the whole. But the profits of the Fulham Works, which supplied Paddington, and the expenditure connected with those works, were entirely distinct.

The ASSISTANT-JUDGE: Then the examination required on the other side is only for the purpose of testing and ascertaining whether the figures produced here to-day are borne out by reference to your vouchers?

Mr. CLERK: That is all.

The ASSISTANT-JUDGE: I can quite see what is the reason of their indisposition to grant a general investigation of their accounts

Mr. DENMAN asked the court to permit Mr. Fuller to state what took place on the occasion of his attending at the company's office for the purpose of inspecting their accounts. [The learned judge having assented, Mr. Fuller made a statement of the circumstances, in some of the details of which he was afterwards corrected by Mr. Field, the company's accountant.]

The ASSISTANT-JUDGE: Is there any objection on the part of the company to permit some person, who is entirely independent of both parties, to look at these ledgers?

Mr. CLERK: It is a very unusual course, and, I think, a very dangerous precedent.

Mr. DOWDESWELL: I must ask, also, for the half yearly balance-sheet.

Mr. CLERK said there was no printed balance-sheet. There was a statement laid before the proprietors each half year, for the purpose of showing the profits of the company, and what the dividend should be; but that was made up of all the works of the company, and they certainly did not propose to give that to the respondents. There was no separate half-yearly account for the Fulham works, and the general account of the company could not at all afford information as to the rateable value in Paddington; and the company did not know what use might be made of the information gathered from it, in other parishes. Their books and vouchers were kept so distinct that, though he felt it was an unusual course to adopt, he had not the slightest objection to allow the books to be inspected.

The ASSISTANT-JUDGE: It is a mere question of convenience, for they would have the right, by giving you notice, to require you to bring all your books, and go into this very examination here. It is only a question whether this court is to sit for a week doing the work, or whether some person in whom the parties have confidence should do it, and bring us the result. You see you give them a statement, and they want to look at your books so

far as to enable them to see whether, as regards these entries, they are correct—guarding, of course, with great care against any use being made of it.

Mr. CLERK: As we have determined, in conducting our case, to go upon the state of the accounts, it is only fair—and, indeed, it is our duty—to satisfy you and our opponents that they are correct.

The ASSISTANT-JUDGE: We have a right to assume that the parish are correct in the assessment put upon you, and it is for you to cut it down. In the absence of any evidence to the contrary, the presumption would be against you.

Mr. CLERK: It is surely an unfair thing not to have given us any notice of an intention to apply for an adjournment. We have come down here with a carriage-load of books.

The ASSISTANT-JUDGE: I think, if this application is yielded to on the part of the company, and when the respondents come here again they fail to prove their case, they ought to pay the costs of the day.

Mr. CLERK: Under any circumstances, I should think you will say they ought to pay the costs of the day, for if they had given us notice of this application, we should not be here with our witnesses. No notice was conveyed to me of their intention to apply for a postponement, and it is putting our company to a great expense to have our witnesses here for nothing. In a recent case, I applied for a postponement, and the court granted it on payment of the costs of the day.

The ASSISTANT-JUDGE: The question is, whether there have been any *laches* on their part. The question ought to stand upon the point of whether the application is reasonable or unreasonable.

Mr. CLERK said the rate was originally £520, and it had been raised by the parish to £4005.

The ASSISTANT-JUDGE: What do you say it ought to be?

Mr. CLERK: We say £523 is an ample rate.

The ASSISTANT-JUDGE: That is the net rate.

Mr. CLERK said that, acting upon all the recognized principles which had governed rating cases, and which he believed would govern the court in the present case, £523 was abundant.

The ASSISTANT-JUDGE: If they fail in supporting their rate, they must pay the costs.

Mr. CLERK: Substantially fail.

The ASSISTANT-JUDGE: Yes; I will not say by £5, but if so small an alteration is made in the £523 as to show that this application was really uncalled-for, they will have to pay the costs.

Mr CLERK: Surely it should be that if so large a deduction is made from their £4005, they should pay the costs.

The ASSISTANT-JUDGE: How are they to get the opportunity of judging without your accounts?

Mr. CLERK: When the number of retorts at any particular place is known, they can approach and make a pretty accurate calculation.

The ASSISTANT-JUDGE: It is very important to the company as well as to the parish that the decision in this case should be satisfactory as to the mode in which it is conducted.

Mr. CLERK: Most certainly; and I am most anxious on the part of the company that they should be satisfied.

The ASSISTANT-JUDGE: Are the parish willing to take it upon this condition, that if they fail they should pay the costs of the day?

Mr. DOWDESWELL: I am quite willing that, if we do not succeed in raising the rate above £523, we should pay the costs.

Mr. CLERK: I will take it upon substantial failure, and your lordship shall judge what substantial failure is.

The ASSISTANT-JUDGE said that, if the names of three persons were handed up by both parties, the court would be able to decide as to who should be intrusted with the examination of the company's books. They should be persons thoroughly conversant with accounts, and also thoroughly impartial; and, in order to save time, if in the course of the investigation any difficulty should arise as to what should be done, or whether any particular document should be shown, the parties might apply to him.

Mr. CLERK: Possibly, it would not be unreasonable that your lordship should give this as a sort of direction, that everything relating to the matter in Paddington is the thing to be examined into, and every matter so far as it relates to Paddington is to be shown, but they are not to be entitled to a general investigation of the accounts.

The ASSISTANT-JUDGE: Certainly not.

Mr. DOWDESWELL: Only what is necessary for the inspection.

The ASSISTANT-JUDGE (to Mr. Clerk): If, instead of making your statement, you were to put your figures in writing, the duty of the gentleman appointed would be to take that statement and ascertain from an inspection of the accounts whether it is correct.

Mr. CLERK: He is not to be the arbitrator, but to inform the parish.

The ASSISTANT-JUDGE: He will be the party to inform the court.

Mr. CLERK: He is a gentleman going on the part of the parish, with our consent; but we are not to be bound by his views.

The ASSISTANT-JUDGE: He is to furnish reasons for our guidance.

Mr. DENMAN: He will report the figures to the court.

Mr. CLERK: He reports them to you. Instead of having the trouble to examine the matters here, he is to go, with our consent, on the part of the parish, as an impartial person, for the purpose of informing the parish, as their witness, whether he thinks our accounts are correct.

The ASSISTANT-JUDGE: You will not be precluded——

Mr. CLERK: Nor will the court attach any greater weight to his opinion than to that of any impartial person.

The ASSISTANT-JUDGE: And as having had the opportunity of inspecting the figures.

After some conversation between the parties,

Mr. FULLER, the vestry-clerk, said: It has been agreed that Mr. Begbie, the accountant, shall be appointed, to be attended by Mr. Barlow, the well known gas engineer, on the part of the company, and by Mr. Lee, on behalf of the parish.

The further hearing of the case was then adjourned till Saturday, the 9th of March.

Mr. CLERK said the appeal of the company against the sewer-rate would also stand over, as it depended upon the same particulars. There was, however, in addition, the question of non-rateability, and also the amount of benefit received. It would hardly be worth going into these until the facts connected with the poor-rate were settled.

Mr. DENMAN: Of course, Mr. Lee and Mr. Barlow are to have the opportunity of inspecting the works as well as the books?

Mr. CLERK: Certainly; we have never made the slightest objection. Even Mr. Penfold and Mr. Castle have seen the works.

Mr. DENMAN: May they see them again?

Mr. CLERK: I have yielded a great deal to-day, but Mr. Denman is trying whether he can squeeze anything else out.

The ASSISTANT-JUDGE: The works have no reference to anything else?

Mr. CLERK: No. They may come and see our works, and Mr. Penfold, in his next edition, will perhaps notify our liberality and kindness.

Miscellaneous News.

THE METROPOLITAN GAS SUPPLY.

WESTMINSTER DISTRICT BOARD OF WORKS.

The ordinary monthly meeting of the Board was held on Friday, the 8th instant, at the offices, Great Smith Street, Westminster—Mr. EDGAR HORNE in the chair.

The CLERK brought up a report from the Committee of Works, recommending *inter alia* that a sum, to be fixed by the board, be presented to Mr. Arntz, as a remuneration for the services he has rendered, in making experiments and reports for the past two years, on the illuminating power of the gas supplied in this district by the Chartered Gas Company.

Mr. HUGHES, as chairman of the committee, stated that no specific sum had been suggested, because it was thought better that the matter should be discussed by the board. In his opinion, the services rendered by Mr. Arntz had been very valuable; and he was aware that they had involved a large amount of labour and time. There were but few precedents to guide the board in reference to the amount of remuneration which should be paid for such services, but he might state that Dr. Letheby received 100*l.* a year for experimenting upon the gas in the City of London, and in some other places 50*l.* per annum was given to the testing officer. His own impression was, that the board should present Mr. Arntz with £50; and he would move a resolution accordingly.

Mr. HUBBUCK seconded the motion.

Mr. SHEDLOCK, amidst many interruptions, made a long speech in opposition, in the course of which he insisted that these experiments had been worthless to the district, and were only originated for the purpose of assisting certain parties in getting up a Parliamentary inquiry, and secure a position for the promoters. Fortunately, as far as the latter object was concerned, the persons engaged in it had been thwarted; but the result of the agitation had been to saddle the metropolis with the consequences of a monopoly in the supply of gas. He asserted, also, that after the board had gone to the expense of providing a costly apparatus, Mr. Arntz had volunteered to conduct the experiments; and, even if he had not done so, it was but a part of his duty to carry them out, if the Board desired it.

Mr. SCUDAMORE denied that Mr. Arntz had ever volunteered such service, and charged Mr. Shedlock with having advocated the continuance of the experiments when the surveyor himself thought they were no longer needful.

Mr. HUBBUCK said it was no part of Mr. Arntz's duty to make these investigations, and it was ungracious on the part of members of the board to refuse to remunerate him for services which they had requested him to perform.

After a lengthened discussion, Mr. Hughes replied to the objections which had been raised, and said that seeing the turn the discussion had taken, he should ask the seconder to consent to the motion being withdrawn for the present. Mr. Hubbuck, however, refused to comply with the request, and the motion was then put and negatived. Mr. Scudamore then proposed that £25 should be given to Mr. Arntz for his services, which, after some conversation was agreed to.

Mr. HUGHES moved "That the clerk be instructed to procure copies of the last accounts of receipt and expenditure deposited by the Chartered, the Western, and the Equitable Gas Companies, in accordance with the Gas-Works Clauses Act, and that in future such Accounts be regularly filed in the office of the board, and be published with the Annual report of the board." By the recent Act of Parliament, relative to the supply of gas in the Metropolis, all the companies were brought under the operation of the Gas Works Clauses Act, and as the information to be afforded by these accounts was of considerable importance to the ratepayers, he had taken the earliest possible opportunity to move for their production.

Mr. HARTLEY seconded the motion.

Mr. SHEDLOCK took the opportunity of asking the solicitor, whether the costs of promoting the Metropolis Gas Bill, had yet been taxed?

Mr. ROGERS said he had received a letter from the Parliamentary agent of the Metropolitan Board, stating that the bill of costs had been sent into the taxing office, but at present no day had been named for the taxation.

Mr. HUGHES objected to any discussion of the matter as irrelevant.

Mr. ROGERS in reference to the motion, suggested an alteration to the effect, "That the clerk be instructed to apply, &c." He was not quite sure that the Clerk of the Peace was bound to furnish copies.

Mr. HUGHES said he had made a similar motion on a former occasion, in reference to the accounts of the water companies, and there was no difficulty in the matter.

Mr. ROGERS said that might be, because the water companies were bound to send their accounts to the vestries, from whom they could easily be procured.

The motion, as altered, was after some conversation put and carried.

CITY OF LONDON GASLIGHT AND COKE COMPANY.

The Half-Yearly Meeting of Proprietors was held at the Company's Offices, in Dorset Street, on Wednesday, the 6th inst.—ROBERT ALEXANDER GRAY, Esq., in the chair.

The corporate seal having been affixed to the register of proprietors, the secretary, Mr. R. J. Millar, read the advertisement convening the meeting, also the report laid before the last half-yearly meeting, which was confirmed.

The SECRETARY then read the directors report and the audited accounts of the company for the half year ending the 31st of December, 1860, as follows:—

Your directors on this occasion proceed at once to direct your attention to the accounts for the half year just closed, which, they are happy to say, are satisfactory.

The rental for the six months is £39,072. 2s. 2d., being an excess over that of the corresponding period of 1859 of £2368. 13s. 10d.; the increase upon the whole year is £6912. 3s. 10d..

The expenses of the half year have exceeded the usual average, in consequence of the periodical reinstating of the clay retorts, as well as the dry-lime purifiers having occurred during that period, amounting together to about £4900. Notwithstanding this extra outlay, the net profit for the half year, as per No. 1 statement, is £7481. 16s. 5d., subject to income-tax, and there now remains at your disposal, including the balance brought forward from Midsummer, as per No. 2 statement,

the sum of £15,688. 1s. 8d., subject to income-tax. Out of this sum your directors recommend you to declare a dividend for the half year as before—viz., on the A. and new shares at the rate of 7 per cent. per Annum; and on the B shares, at the rate of 4 per cent. per annum, in accordance with the Act of Parliament, the whole to be paid free of income-tax.

It will be observed by the accounts that there is a reduction in the amount at the credit of the reserve-fund. This is occasioned by your directors having had to charge thereto sundry special expenses, such as the company's portion of the cost of opposing the Metropolis Gas and Metropolitan Local Management Bills, not strictly arising from the half year's proceedings.

Your directors report that the works in connexion with the erection of the new gasholder are progressing satisfactorily. The continuous wet weather through the autumn prevented their completion so early as was anticipated in the last report. It is, however, confidently expected the gasholder will be ready for use in the course of the spring.

Your directors have paid to the New River Company £30,000, in part of the purchase-money agreed upon. To enable your directors to complete the purchase, and also to defray the cost of the gasholder, they avail themselves of the powers given to them by the meeting of the 2nd of February, 1860, and have decided to make a further call of £2 on the new shares, which call they now delare to be due on the 18th April next, with option to the shareholders to pay up the same in anticipation. Interest to be allowed from the day on which such payments are respectively made.

Your directors close their report by stating they have issued bonds during the half year for £6750; making, with what has been previously reported, £17,250 received under the borrowing powers of the Act of Parliament, and they are prepared to receive applications for a further issue.

Dr. *Statement of Profit and Loss, for the Half Year ending Christmas*, 1860. *Cr.*

To Cost of coals consumed, including porterage	£19,110	10	0	By Rental	£39,072	2	2
Rents, rates, and taxes	1,167	2	0	Coke	8,539	10	9
Wages	8,581	11	9	Breeze	279	14	0
Directors' and auditors' fees	551	5	0	Liquor	366	15	9
Salaries	1,990	0	0	Tar	1,094	2	0
Tradesmen's accounts	8,275	13	8	Old materials, &c.	477	18	10
Repairs and depreciation of meters	1,104	6	5	Transfer fees	5	16	6
Petty cash disbursements	522	9	8				
Interest	699	9	8		£49,836	0	0
Bad debts, &c.	351	15	5	Balance of profit brought down	£7,481	16	5
Balance	7,481	16	5				
	£49,836	0	0				

Dr. *General Balance-Sheet, Christmas*, 1860. *Cr.*

To Capital	£340,060	0	0	By Plant	£348,486	9	1
Loan-fund, with interest to date	19,964	11	10	Leasehold property	5,184	0	0
Debenture bonds, ditto	17,534	6	0	Amount due for light	£30,451 18 2		
Reserve-fund	8,557	12	0	Ditto coke, &c.	4,521 7 1		
Mr. Benham's benevolent-fund	1,000	0	0	Ditto sundries	11,568 6 3		
Amount of debts due to sundries	36,810	1	5		46,541	11	6
Balance carried down	15,688	1	8	Amount of cash on hand	£7,627 15 10		
				Ditto petty cash	2 17 10		
				Ditto City gas shares	6,652 0 0		
					14,282	13	8
				Stock on hand—			
				Coals, &c.	£1,294 6 5		
				Materials	2,141 13 10		
				Meters	21,683 18 5		
					25,119	18	8
	£439,614	12	11		£439,614	12	11
				Balance of profit brought down	£15,688	1	8

The CHAIRMAN: Gentlemen, on former occasions it has been my practice to make a few observations to you in connexion with the report and accounts. I shall do so again to-day, and afterwards any proprietor present will have the opportunity of asking such questions upon the subject as he may desire; and I will give such answers as I think I can do with propriety and a due regard to the interests of the company. At the same time, I may say that I am quite sure no gentleman who feels interested in the prosperity of this company would desire to put any questions to me but such as are dictated by sound sense and a proper consideration for the interests of the concern. It may appear to some of the proprietors present that the satisfactory increase which has taken place in our rental ought to leave us with a larger disposable balance to be divided among them on this occasion; and I am desirous to anticipate any questions which may be put to me with reference to that subject. It has been stated in the report that, during the past half year, our expenses have been larger, owing to the necessity we have been under in reinstating our retorts and purifiers. This has diminished considerably the disposable balance carried down. We have expended in reinstating retorts the sum of £4375, which amount has to come out of your profits. In addition to that, we have laid out upon the purifiers a further sum of £800. Neither of these charges will probably occur again for two or three years to come. We have also thought proper, seeing the largely accumulating sum invested in meters, to write off for repair and depreciation the sum of £1100, instead of £500, as we did for the corresponding period of last year. During the next half year, you will derive some advantage from our purchase, inasmuch as we shall only have to pay to the New River Company £200 for interest in April next, which will effect a saving for the half year of £780. You will easily suppose that the expenses for wages have considerably increased, in consequence of the very wet season we have had, and the very severe frost which occurred subsequently. You are all aware that a heavy expenditure must fall upon any company which employs continuous labour upon their works, when such interruptions take place in their proceedings. In consequence of the late severe weather I dare say, in many instances, the men did not work one-third of the day; still, we had to pay them all the same. From inquiries I have made, and with the anxious desire of your directors to diminish the expenses of the company as much as possible, I have no hesitation in saying that our wages will be less, for the next half year, by £500; and that, taking the year together, we shall effect a saving of £1000. These are very important considerations, from which I feel satisfied that we are justified in proposing the same dividend as on the former occasion. Had I the most distant supposition that anything would occur to cause an interruption to our prosperity, I should hesitate to sanction such a proposal. After providing for the payment of the dividend which we recommend, and which I hope you will confirm, there will remain a balance of rather more than £5000, in addition to which we have £8500 as a reserve-fund; making altogether nearly £14,000 in hand. It has been mentioned in the report that the reserve-fund has been diminished during the past half year, in consequence of the parliamentary and other extraordinary expenses which have been incurred. I consider that that was a very proper fund to have recourse to under the circumstances; and it will always be my desire, in the propriety of which, I doubt not, you will concur, to keep that undivided fund as long as we can, for the purpose of meeting contingencies. I most sincerely congratulate the company that the Metropolis Gas Bill passed through the House of Commons; I trust that it will not be interfered with for many years, and I hope also, that the parties who promoted it are satisfied with the form in which it passed the Legislature. At all events, the gas companies are placed in a much better position than they would have been if it had been withdrawn, a course to which, when proposed, I offered a most strenuous opposition; and I think that those for whose benefit it was promoted, as well as the companies, may rest perfectly satisfied with it. You are all aware, gentlemen, that, some time ago, the gas companies consented to give their stokers a Sunday alternately to themselves. I quite concurred in the propriety of these poor fellows having some relaxation from their labours, and we fell in very cheerfully with that suggestion. But I should state to you, that the adoption of the plan has inflicted upon us a loss of £300, inasmuch as the supply of gas must be continued by some one; and, when these labourers are away from their work, some others have to take their place. Still, I think the money is well laid out, for the duties which these men perform are very severe, and I am sure it is the desire of every gentleman present that the poor fellows should have some time for relaxation from work. I know my friend, Mr. Box, will ask questions of me, and therefore I think I may as well anticipate him. I have nothing to conceal from Mr. Box, though I sometimes question his discretion in the inquiries that he makes; and I am quite sure the proprietors present will signify as much if they think that my explanations to him now are not to the purpose. Perhaps, gentlemen, I have now said enough, and I think I may as well sit down. I will only say that I am always much gratified in meeting my friends in this room, for, whether our circumstances have been prosperous or otherwise, they have always received the reports of the directors with the utmost good feeling and cordiality. Of one thing they must be perfectly satisfied, that, whatever may be the exertions of the directors, they cannot control events; they must bend to circumstances. Here, for instance, we have in our accounts an expenditure in meters—a downright waste of money—£21,000—forced upon us by Mr. Pearson, and the Great Central Company. The reason that he assigned for our supplying meters to our consumers was this: he said, "Why should not a gas company furnish the measure by which their gas is supplied precisely on the same principle that the linendraper supplies the yard by which he measures a piece of silk?" But, what is the fact? a yard measure will last for all eternity; it will be as good 500 years hence as now; and one measure does for all his customers, whereas each of our consumers is to be supplied with a separate meter, which is worn out in five or six years! Hitherto, they would not allow us to make any charge for meters; but, I am happy to say the new Metropolis Gas Act gives us power to charge a per centage upon their cost price, which will be a considerable advantage to this company, and to all other companies similarly situated. I will now conclude by moving—"That the half-yearly report and accounts be received and adopted."

Mr. PERRY: I second the resolution with much satisfaction.

Mr. BOX: From the reading of the report, I was led to understand that there will shortly be a call, and that it will be in the option of the proprietors to pay up the whole which may be due upon their shares, receiving interest upon that portion so paid which is uncalled for.

The CHAIRMAN: You are in error; therefore, allow me to correct you. We only intend to call up £2 per share; and, if any proprietor likes to anticipate that call, which will be due in April, he may do so, and receive interest upon his payment from the day on which it is made.

Mr. BOX: Will they receive interest upon the remainder of the money? Some companies have paid it, and some have not. What rate of interest will be paid?

The CHAIRMAN: The present intention of the directors is to call for £2 a share. We cannot call for more, according to our Act of Parliament, except after an interval of two months.

Mr. BOX: The report which we are now asked to adopt, of course we knew nothing about until we came into this room. Almost the whole of the other metropolitan companies circulate their half-yearly reports previous to the meeting of proprietors, and I should like to know whether a similar arrangement could not be adopted in this company. I called on your respected secretary last week for some information, which he most readily gave me; but, when I came to make use of it, I found that I had not got a printed statement of our last half-yearly accounts. At the same time, I felt sure that I had seen the report and accounts in print somewhere, and therefore I suppose it must have been in the JOURNAL OF GAS LIGHTING. Now, as after our meetings the reports laid before the proprietors are published in the pages of that journal, and are therefore open to all the world, there can be no objection to the printing of those reports by the company; and certainly it appears to me it would be desirable to do so before our meeting, so that we may know what we have to come here to discuss, before hearing it read by the secretary. I quite agree with the observations made by the chairman with respect to the finances of the company, and do not know that there is any one thing in reference to our affairs that I could possibly object to; but then, I must say that I know nothing about them. I have very carefully

analyzed the information which I obtained from the office, and though I do not go into the results of that analysis on the present occasion, I may observe that I believe, during the next twelve months, our unaccounted-for gas will be greatly reduced by the new gasholder coming into operation, and that you will be enabled to maintain a satisfactory supply to the consumers of the City of London, without any extraordinary expense. I think, as I said before, that the circulation of the directors report before holding the meeting of proprietors, is so important that, unless there is an objection to it, I shall move a resolution upon the subject.

The CHAIRMAN: The objection to it is, that it cannot be done; and the fact that it is done in other companies, does not at all bear upon this company. Our accounts are made up about the middle of January, and between that period and the meeting of proprietors there is not time to do as you wish. My worthy friend forgets to tell the proprietors that there is no other company in the metropolis which hold their meeting so soon after the close of the half year as we do. The Phœnix do not meet until near the end of February, the Commercial until April, and the Chartered Company until May; so that they have ample time to publish their accounts. We, however, cannot do it; and I am sure, if such a resolution as Mr. Box speaks of is proposed, it will not be supported. As our mode of proceeding hitherto has given satisfaction to the proprietors, I should be sorry to see any interference with it, because I believe our arrangements are consistent with common sense and the real interests of the company. At the same time, I have not the slightest objection to anything which may be proposed for the purpose of giving information to the proprietors. It is true my friend sees the report and accounts published, as he says, in the JOURNAL OF GAS LIGHTING; and, if I recollect right, he was the first person who proposed that the reporter of that journal should be admitted to the meetings of the metropolis gas companies.

Mr. BOX: I was, and I did so, because I could not get their accounts.

The CHAIRMAN: Then, my good friend, you have got all you want; and I think I have given you a satisfactory reason why we are not able to circulate our report before the meeting of proprietors.

Mr. LAVANCHY: I think Mr. Box is out of order in raising this question now. He should have done so when the confirmation of the last half-yearly report was put to the meeting.

The CHAIRMAN: No, Mr. Box is perfectly in order as to that; and I will just say that, if the proprietors desire it, we will adopt any suggestion they may think it advisable to make; but, if the accounts are to be published before the half-yearly meeting, it will be necessary to adjourn that meeting to a later period; so where is the advantage?

Mr. HARDWICK: I do not think there is any necessity for it, and I should oppose such a motion, if it were made. At present, there is no such proposition before the meeting.

Mr. BOX: I should be very sorry to oppose myself to the views of the meeting, but I am speaking for the benefit of the proprietors generally. If, however, the chairman says I can have what information I want respecting the two half-yearly accounts by applying at the office, I shall be satisfied.

The CHAIRMAN: In answer to that, I will say at once that you may have it for the last six years, if you desire it.

Mr. BOX: Then I will say nothing more upon the subject.

Mr. HADLAND: I may just call attention to one fact, which will show that it would be impossible to carry out Mr. Box's suggestion. The auditors only certified to the correctness of the accounts yesterday; so that, unless the meeting were postponed, those accounts could not be circulated among the proprietors beforehand.

Mr. BOX: I do not wish to put any obstacles in the way of the directors, or to interfere at all with their regulations; but I think you might have a *pro formâ* meeting to-day, and then adjourn for a month, as the Phœnix Company do.

The CHAIRMAN: I will tell my friend Box and every gentleman present, if it is necessary, that there is no desire on the part of the directors to conceal anything from the proprietors, or to withhold any information necessary for the elucidation of the accounts of the company.

Mr. BOX: My only desire is to benefit the concern, and, though my views may be adverse to those of many other gentlemen present, I think every proprietor should feel himself at liberty to express his sentiments in reference to our affairs.

The CHAIRMAN: And I am sure you will do me the justice to say that I have never interfered with your doing so, though I have often heard you make a long speech, in which I could not coincide. I must say, however, that I think the gas companies are much indebted to you for the information you have sometimes elicited at their meetings; and, as far as this company is concerned, I can assure you I shall always be ready to give you all you want, provided it will not be prejudicial to the general interests of the concern.

The resolution was then put and carried unanimously.

Mr. WARD: It is my pleasing duty to move the adoption of the dividend recommended by the report. I think, after the manner in which the chairman has explained all the circumstances connected with the accounts of the company, it would be preposterous, on my part, if I attempted to take up any time, by making any remarks on the subject. I shall, therefore, at once move, "That, agreeably to the recommendation contained in this day's report of the board of directors, a dividend out of the profits of the concern for the half year ending Christmas last, be now declared as follows:—On the A shares, at the rate of 7 per cent. per annum; on the B shares, at the rate of 4 per cent. per annum; and on the new shares, at the rate of 7 per cent. per annum; the whole to be paid free of income-tax, at the company's office, on the first Tuesday in May, and on each succeeding Friday and Tuesday, between the hours of twelve and one o'clock."

Mr. WALMISLEY: I have great pleasure in seconding the motion, and I would do it with a single observation. At the last half-yearly meeting, a hope was expressed that we should, by degrees, arrive at an earlier payment of the dividend, and that the amount would be as it was in the good old days.

The CHAIRMAN: Then we were getting 8s. and 10s. for gas.

Mr. WALMISLEY: I am very pleased, and perfectly satisfied with our accounts, and with the dividend.

The CHAIRMAN: But you want it a little earlier?

Mr. WALMISLEY: The suggestion was thrown out at the last meeting, and I thought it might possibly be so arranged.

The CHAIRMAN: If it were done, it would only make a difference for the first half year, because afterwards the dividends would only be paid at intervals of six months, just as they are at present. In the case of the Chartered Company, they make up their accounts to the end of June, but they do not pay their dividends till November, and the dividend on the Christmas half year is not paid till May. It is just the same with the Equitable, Commercial, and other companies—the only exception being that of the Phœnix, who pay their dividends on the day of meeting.

Mr. WALMISLEY: The Ratcliff Company do the same.

The CHAIRMAN: Yes—and the Imperial; but I do not know of any others. In putting this resolution, I may just say that, with respect to the 4 per cent. on the B shares, we are limited to that rate by the Act of Parliament, and, though it is an unfortunate thing, we have nothing to do but to bear with it.

The resolution was then put and carried.

Mr. HARDWICK: I have a very pleasant task devolved upon me, and, in performing it, I shall only take up your time for a very few minutes. It is a duty that I have frequently had the pleasure of performing, and I do it on this occasion with at least equal satisfaction. You have heard the excellent statements of our chairman, and the admirable report of our directors. We must all feel satisfied with the exertions which the board have made during the last half year, in order to keep us in the same position with regard to the amount of dividend that we were in previously. We could hardly expect it, considering the additional large expenses which have been necessarily incurred; and yet to-day we have the gratification of finding that there is no diminution in our dividends. And, though we have had to bear our share of a great parliamentary contest, we are in an equally prosperous state to that in which we found ourselves when we last met together. Without obtruding myself, therefore, upon your attention any further, I will move—"That the cordial thanks of this meeting be offered to the chairman, deputy-chairman, and the other directors, for their continued and unabated attention to the interests of the company."

Mr. LAVANCHY: It is with very great satisfaction that I rise to second the resolution, and I believe that every proprietor present will share in my feelings on this occasion. The chairman has passed a high eulogium on the officers of the company for their exertions; but I would ask, however well that eulogium may be deserved, what would the officers of the company have been without such an excellent captain and such excellent sidesmen as we have in our board of directors? We are only discharging in a feeble way a debt of gratitude when we pass this acknowledgment of their labours on our behalf. I trust that Providence will spare them long, to superintend our affairs with as much energy, and with such good results as they have hitherto done.

The resolution was cordially adopted.

The CHAIRMAN: Gentlemen, for myself and colleagues I would say that we feel very sensible of the kindness shown to us by the manner in which this resolution has been proposed and carried. I will only assure you that so long as we enjoy your confidence, no means will be left untried by us to promote the interests of the company. I may say, in passing, that I believe a great saving will be effected when our new gasholder is completed; indeed, I have not the slightest doubt about it. At the present time, we are at heavy expense in drawing our retorts much quicker than we ought to do; and this is not the only disadvantage, for our retorts lie by three quarters of the day, occasioning a manifest loss to the company. When our gasholder is in operation our stowage will be so considerably increased that in the course of next year we shall, in a great degree, discontinue the use of iron retorts altogether, and substitute clay retorts for them, which will effect a considerable saving. I have no hesitation in saying that everything looks very prosperous, as far as this company is concerned; and, for ourselves, I will say that we will do all in our power to economize the expenditure and advance the interests of the concern. In the name of myself and my colleagues, I thank you most sincerely for the honour you have conferred upon us.

Mr. LAYTON: I think, before we separate, we should recognize the services of our auditors. They are to us what the consuls of old were to the higher powers; they are our tribunes, to protect our interest. They have great and important duties to perform, much more than the mere examination of the statement of accounts presented to you on these occasions. These are but the summaries which they arrive at through an investigation of a large number of details. They are, therefore, entitled to our acknowledgments; and I have much pleasure in proposing a vote of thanks to the auditors for their zealous attention in the discharge of their duties.

Mr. BOX seconded the resolution.

The CHAIRMAN: I can only say, from the knowledge I possess, that the auditors are well deserving of the confidence which you have placed in them.

The resolution was unanimously adopted.

Mr. HADLAND: I beg leave to return you our thanks for this mark of your confidence. The accounts of this company are, as you may suppose, very voluminous, and I think it would be impossible to carry out the suggestion in reference to their publication before the meeting.

A PROPRIETOR: Should we not have a resolution in reference to the call?

The SECRETARY: The general meeting of proprietors in February last gave the directors power to make the call, and they have only now to report to you their intention to do so.

The CHAIRMAN: Gentlemen, the proceedings are now brought to a close. I hope no one will go away disappointed, and that when we meet you again we shall have even something better to tell you.

SOCIETY OF ARTS.

WEDNESDAY, FEBRUARY 6th, 1861.

ON THE PRESENT CONDITION OF THE WATER SUPPLY OF LONDON.

By GEO. R. BURNELL, Esq., C.E., &c. &c.

A few years since public attention was called, in a very prominent manner, to the numerous questions connected with the quality and the mode of distribution of water in the metropolis, and a very expensive Parliamentary contest was waged between the advocates of the existing companies on the one side, and the General Board of Health on the other, which for a time clothed the whole subject with interest. After the excitement of the contest had passed away, the public interest seemed to have subsided; and, at the present day, the London population is contented to enjoy the advantages of the water supply it possesses, without much inquiry into the means and agencies employed in securing that blessing. Nevertheless, the subject is one of sufficient importance to merit an occasional review; and as some very able persons connected with the administration of the laws affecting the public health, have felt called upon to make what may be considered to be accusations against the quality of the London water supply, it has seemed to me desirable to bring about, if possible, an open discussion as to the merits and demerits of the present water supply, and as to the feasibility of some of the schemes proposed to remedy its defects. In some cases, the operations of the water-works companies, subsequently to the passing of the Act of 1852, have also raised questions of the highest interest with respect to the subterranean geology of London, which I think merit more attention than they have yet received, and it will be my object briefly to allude to the conclusions fairly to be drawn from the facts observed with respect to them.

London, as you must all know, is built in the centre of a large basin of the tertiary formations composed mainly of stiff blue clays, underlying occasional patches of sands and gravels, and consisting at its base of permeable sands and mottled clays. The basement beds rest upon a depressed surface of chalk; and if, for the present, we limit our survey to the superficial geology, we find that, around the lower margin of the chalk, the sub-

cretaceous formations outcrop in the valley of the Thames, to be succeeded by the oolites, and that none of the affluents of that river flow from any of the strata older than the oolites. All these formations, it is important to observe, are of more or less a moveable character, and their materials can easily be disturbed by heavy rains; moreover, nearly the whole of the surface of the valleys of the Thames, and of its affluents is under cultivation, and is therefore the more susceptible of such disturbing actions. Lechlade, the first point where the navigation of the small head streams of the Thames commences, is situated at about 146 miles from London, and at an elevation of 258 feet above low water-mark of London Bridge. From thence the river, called in this part of its course the Isis, receives the Evenlode and the Charwell, flowing from the oolite and lias groups; then, below Oxford, it receives the Thame, also from the oolite and Oxford clay; the Windrush and the Ock, from the chalk, or from the subcretacious deposits; at Reading, it receives the Kennet from the chalk; at Maidenhead, the Loddon, from the London clay; at Staines, the Colne, from the chalk; at Ham, the Wey, from the green sand under the chalk and the chalk itself; and, shortly beyond the junction of the Mole, the tide is shut out by means of the Teddington locks. There are a few insignificant streams supplied to the Thames by the Bagshot sands, and, as we have seen, a few streams are derived from the lower green sands; but nearly all the affluents and the main stream are supplied by the formations which are likely to communicate to their waters the bicarbonate of lime; and from their high state of cultivation, and the number of inhabitants on their banks, it is fair to suppose that they also contain a rather large portion of organic matter. These remarks might be extended to the waters of the Lea and of the Ravensbourne, for they are both fed principally from the chalk springs of their respective valleys, and from the surface drainage of their water-sheds, which are, as in the case of the valley of the Thames, highly cultivated. The only geological formations of a nature to supply pure, soft waters, in sufficient quantities for the consumption and the waste of a town like London, are situated at a very great distance from it. The Bala Lake, to which it has been proposed to resort, is, in fact, situated at about 170 miles, as the crow flies; nor are there any large bodies of water of a similar character to it to be met with nearer the metropolis, nor are any of the primary or plutonic rocks to be found within a reasonable distance.

In addition to the sources of water supply provided by the river and its affluents, the inhabitants of London were able formerly to derive a large quantity of water from shallow wells, sunk in the superficial gravels, or from deep wells sunk into the sand beds of the London clay, or into the subjacent chalk. For all municipal purposes, the wells in the gravel have long since become useless, and, both on the score of the quantity and of the quality of their waters, they may be here passed over, especially as the recent inquiries with respect to the effect of their waters upon the diffusion of the cholera, have raised so strong a feeling against their use, that no one would dare now to recommend those waters for any other purpose than for filling such pieces of ornamental water as the Serpentine, or St. James's Park. The deep wells in the basement bed still yield large quantities of water in some parts of London, and they are of great local value to manufacturers; but, in other parts of the hydrographical basin of the metropolis, in consequence of the existence of a series of upheavals and displacements, the supply to the underground beds is so intercepted, and, at the same time, so great is the demand upon them that, even in the most favourable places, they are gradually becoming exhausted. In the works of Messrs. Prestwich, Mylne, Braithwaite, Clutterbuck, &c., will be found a great mass of information on the subject of the gradual exhaustion of the subterranean water-bearing strata of London; and the permanent depression of the water-level in them has actually become an evil of serious practical magnitude to the factories which rely on this source of supply. It seems, however, that as much as 20 million gallons per day are still drawn from the various wells about London, but now, principally from the chalk. After the incessant rains we have had for the last eighteen months, it is possible that the level of the water in these wells may have risen; but the first drought will cause it again to fall, and every improvement which takes place in the land drainage of the exposed surfaces of the water-bearing strata, must tend to increase the exhaustion of their lower basin.

Although the exhaustion of the chalk, and of the basement bed of the London clay, has been thus markedly ascertained, it is curious that the Kent Water-Works Company should lately have succeeded in bringing to the surface a very large quantity of water by means of some wells sunk in the valley of the Ravensbourne, just before it falls into the Thames, and in the chalk itself. The yield of these wells is sufficiently great to enable the company to dispense almost entirely with its supplies from the Ravensbourne, and the water is bright, clear, and singularly wholesome and pleasant. It seems to me that the explanation of this anomalous flow of water is to be accounted for by the interference with the flow of the subterranean currents in the lower beds of the chalk—firstly, by the great line of fault which has given rise to the valleys of the Lea and of the Ravensbourne on the respective sides of the Thames; and, secondly, by the upheaval, in an east and west direction, which is known to exist between Windsor, Brentford, Deptford, Shooter's Hill, Grays, and the extreme north-westerly point of the embouchure of the Medway. In all probability, also, the same upheaval has thrown to the surface the spring which has lately been shown to exist on the north bank of the Thames, opposite to Gravesend; and I should be much disposed to believe that for many years to come large quantities of water would be obtainable from both the wells of the Kent Water-Works Company and from the newly-discovered spring, without producing any sensible depression of the water-line. At Woolwich, it is true, the Plumstead Company were obliged to sink, or to bore, to a maximum depth of 525 feet before it could obtain even a small supply; but their works were placed on the lower side, in the direction of the dip of the north and south fault of the Ravensbourne valley, and between the latter and the valley of Cray and Darent; so that the contributing area was forcedly a limited one, especially as the boring was not carried down to the more permeable and more highly-charged strata at the base of the chalk. I have heard of Artesian borings having lately been successfully made in the chalk in Bermondsey; and I have little doubt but that similar results would be obtained by sinking down to the chalk marl near the margins of any of the lines of fault already noticed; the effect of pumping liberally from such wells would, however, only be to exhaust the supply; and, in time, it would be found that the phenomena already observed in the upper chalk would be reproduced in the lower beds. It would be long, no doubt, before this effect would really take place; and, in the meantime, we may dwell with satisfaction on the discovery of the new sources of supply at Deptford and at Grays.

The history of the wells in the Deptford valley is the more interesting from the fact of the failure of the attempt to secure a large supply of water from a deep well at Highgate; and it seems to me also to point a moral, which might be very useful to all connected with well-sinking. The Highgate well was commenced with the belief that, by passing through the London clay and its subordinate beds, the chalk, the upper green sand, and the gault, a supply would be obtained from the lower green sand, in the same manner as at the Artesian well of Grenelle. It was known that the lower green sand outcropped on the margin of the gault all round the northern, western, and southern sides of the London basin; and certainly there was no *à priori* reason for doubting the continuity of the stratum beneath London. But, after passing the various strata, including the gault, in the precise order anticipated, and of a total thickness of 1113 feet 6 inches, the boring tools, instead of entering upon the lower green sand, as was then anticipated, passed into a series of beds of sands, sandstones, red clays, &c., which have been considered by geologists to belong to the new red sandstone series. From the results of some other borings recently made near London, I am disposed to believe that these beds are members of the Wealden series rather than of the new red sandstone, notwithstanding the apparent confirmation of the latter theory by the results of the borings at Calais, Ostend, and Harwich, to which I hope to be able to call your attention on a future occasion; but, to whatever portion of the geological series they belong, the effect of their intrusion has been entirely to intercept the flow of the water of the lower green sand under London. Under such circumstances, it was manifestly impossible that water should be obtained at the Highgate well from that formation; and as the chalk, the chalk marl, and the upper green sand yielded comparatively no water, the prosecution of the works was abandoned. It may be added that the Hampstead Company, at whose expense they had been carried on, was shortly afterwards compelled to part with its district to the New River Company.

Now the lesson which may be learnt from this story seems to me to be, that there is little chance of finding water in any deep well, in formations like the chalk, if that well should be sunk in the intermediate zone between two great lines of fissures, such as have given rise to the outbursts of the springs in the valleys of the Colne and of the Lea; and it is to be observed that the indications of these lines of disturbance are to be traced on the south side of the Thames respectively in the valleys of the Wey and of the Ravensbourne. It would seem as though the subterranean waters accumulated near the edge of the fault, and were there forced to the surface; and it is worthy of notice that the springs which supply the four rivers above mentioned, almost all rise on their western banks; that is to say, on the bank corresponding with the upper edge of the dip of the strata. In such cases, the water might even be forced up a free open passage between the disrupted faces more easily than it would rise in a well sunk through the superincumbent strata; and a current once established in such a direction, a well sunk near the apex of the intermediate district, would not receive a larger supply than would arise from the precise area itself had laid bare. The water flowing in the intercepted stratum for a width equal to the dimensions of the well would flow into the latter, but no more; and the only way of increasing the yield of such a well would be by driving a heading across the line of dip, at the level of the water-bearing zone. This at least is certain, viz., that at Highgate and at Woolwich, the wells were sunk below the natural water line of the valleys of the Lea, or of the Ravensbourne, and no considerable volume of water was obtained in either of them.

Now, to revert to the condition of the actual water supply of London, you must be aware that, subsequently to the passing of the Metropolis Water Act of 1852, all the companies have been obliged to remove their sources of supply from positions where the waters were likely to be affected by the tidal action, or by the emanations of large manufacturing districts. The West Middlesex, Grand Junction, and Southwark Companies take their water from the same spot on the banks of the Thames, above the village of Hampton, and above the second lock on the navigation; the Lambeth and Chelsea Companies take their water from Kingston, above the Teddington lock; the East London and the New River Companies take their water from the Lea, the first from a lateral branch from the main stream given off above Clapton, and the latter from the river above Ware; whilst the North Kent Company takes its waters principally from its wells, and partially from the Ravensbourne. In all cases, the companies are bound to filter their waters, and the arrangements for that purpose are of the most elaborate description, and are, moreover, very conscientiously carried into effect. All the storeage reservoirs are covered, and in fact every precaution has been taken to insure the purity and good quality of the waters supplied to the inhabitants of London. Whatever can be effected by skill and science for those purposes, has been done; and yet, month after month, the Registrar-General has thought it to be his duty to make comparisons between the water supplies of London and some other towns, which appear to lead to the conclusion that the London water companies supply a fluid of a very objectionable quality, even if they do not point to the necessity of a radical change of the whole system here adopted.

Without carrying you back into the Registrar-General's weekly returns of the public health, I would refer to those published at the beginning of October, November, and December last, in which the following tables appear:—

1860.	October.		November.		December.	
SUPPLY.	Total impurity per gallon.	Organic impurity per gallon.	Total	Organic	Total	Organic.
Distilled Water	0·00	0·00	0·00	0·00	0·00	0·00
Loch Katrine, Glasgow	3·16	0·96	3·16	0·96	3·16	0·96
Manchester	4·32	0·64	4·32	0·64	4·32	0·64
Great Yarmouth	20·96	3·04	..	..	..	..
Well, Great Titchfield Street	..	..	140·68	16·68	..	..
„ Bexley Street, Camberwell	..	..	..	..	214·00	12·80
THAMES COMPANIES.						
Chelsea	21·40	1·88	21·12	1·12	20·84	2·08
Lambeth	21·20	2·08	21·88	1·68	20·28	1·24
Southwark	20·40	1·12	19·64	1·08	21·60	1·80
West Middlesex	20·16	1·24	20·68	1·68	20·04	1·84
Grand Junction	20·28	0·84	20·96	1·36	21·88	1·60
OTHER COMPANIES.						
East London	23·40	2·04	22·44	1·48	21·48	1·40
New River	20·08	1·12	20·32	1·12	22·30	0·84
Kent	24·64	1·60	23·78	2·68	22·40	0·56

Now, the value of official analyses of this description depends on the extreme care taken with them, and the precautions observed to secure correct results; yet we have this singular fact upon the face of the above table, viz., that the analyses of the supply from the Glasgow and from the Manchester water-works for the three last winter months—during which heavy rains and snow fell, and the trees and shrubs upon the respective gathering-grounds must have furnished a number of dead leaves able to affect the quantity of organic matter, in the waters flowing from those grounds—the analyses have been identical. The comparison between the fixed quantity

of organic matter assigned to the Glasgow and the Manchester water supplies on the one side, and the variable quantities asserted to be found in the London water supplies, goes for nothing under these circumstances. Again, in none of these cases has any public statement been made, of the nature of the organic matter said to be contained in the waters, although it is universally admitted, that the injurious effects of the organic matters in question, depend upon the quantities of the nitrogenous elements they may contain, in a state able to undergo decomposition. The nitrogen of the organic elements which have undergone decomposition, is stated by Hofmann and Blyth to be innocuous, but in the tables above given it is included with the other "organic matters;" and it is by no means impossible, that the actively dangerous elements may exist in the greatest proportions precisely in those waters, which contain the smallest numercial quantities, of the class here grouped under the same name. But be this as it may, it is worthy of especial remark that, on several occasions, the London waters have presented quantities of organic matters which are actually less than those permanently assigned to the waters considered to be "the types of wholesome town supplies."

As to the inorganic impurities in a town supply, there is still so great a variety of opinion as to their influence, that it would be presumption in any one man, or even in any one body of professors, to pass a decided opinion on the subject. From the earliest periods to the present day, it has been held by the most competent inquirers into this branch of pathology, such as Hippocrates, Chossat, Dupasquier, Levy, Dumas, &c., that waters containing a small quantity of the bicarbonate of lime in solution, are those which are the most advantageous for human consumption. It is precisely the bicarbonate of lime which constitutes the bulk of the inorganic impurity of the waters flowing from the various formations of the valley of the Thames; and it appears, from the results of experiments on waters obtained directly from the chalk, that there is a larger proportion of that ingredient present in them, than there is in the waters originally derived from chalk springs, but which have flowed for some time in the open air. The wholesomeness of chalk water, when clear and free from mechanical impurities, is too well known to require more than a partial allusion; and it must, therefore, be a matter of surprise, to those who reason upon these matters, to find that the confidential advisers of the Central Administration should thus persistently dwell upon the amount of impurity in the waters supplied to London, when it is by no means proved that the so-called impurities are not positively advantageous under many conditions of a town supply. No details of the nature of the officially-branded impurities of the London waters are given; but, from analogy, and from isolated experiments, it is fair to suppose that, out of the 21·38 grains of impurity per gallon, there are, in addition to the average quantity of organic impurity, or 1·395 per gallon, about 16 grains of the carbonate of lime with variable proportions of the salts of potash, sodium, magnesia, and calcium. These inorganic substances may even be supposed to play some useful part in the strange chemistry of life; and it is notorious that the waters which do not contain them are often exposed to chemical reactions of a dangerous nature. Thus, for instance, in the case of the Woolwich and Plumstead Water-Works Company, the very beautiful system invented by Dr. Clark for softening the chalk well water, was applied under the very able management of Mr. Homersham, and the impurity was reduced from 23 grains to 7 grains per gallon. But, at the same time, it is to be observed, that the water so softened acted very rapidly indeed upon the lead cisterns and services exposed to it; so much so, I have been informed, as to entail a very heavy loss on the water-works company. Again, the waters of that "type of a town supply," Manchester, are now stated to be able—nay more, to be exposed—to take up lead in sufficient quantities to be deleterious to health; and the story of the lead poisoning of the family of the late ex-king of the French, through the use of a soft water which had been stored in a lead cistern, must be in the memory of all my hearers. I am myself disposed to suspect that there is some degree of exaggeration in the opinion held by those who have written on the deleterious action of soft waters on lead; but the point to which I am anxious to draw attention is this, that until the absolute importance of the actions of various classes of water are known, it is dangerous to cite any one of them as a type of a town water supply; and thus by implication to create a prejudice against other sources of supply. The fact is, that the human constitution is a far more delicate test of the value of a water for this particular purpose than any chemical analysis can be; and, as the health of our London population is by no means inferior to that of the population of Manchester, or even of Glasgow or Aberdeen, whilst its moral habits are no better than those of the towns cited as having a more comparatively pure and soft water supply, it seems to me that there is something at least injudicious in the tone of the monthly criticisms upon the quality of the water, distributed by the London water-works.

There is, moreover, a very serious consideration which, to my mind at least, overrides the whole of this discussion of the quality of the London water supply, viz., that if medical and chemical authorities should agree that the present source of supply ought to be abandoned, there is positively no other source to which we could resort. The notion of forming gathering-grounds and catchwater reservoirs on Bagshot Heath, was too absurd for even the late General Board of Health to support, after it had been exposed to adverse criticisms for a few weeks. The scheme for collecting the waters from the Hind Head district also fell to the ground, on examination; and I myself, from personal inspection of the district, know that not only was the quantity of the water said to be obtainable from it seriously exaggerated, but that the estimated expense of the works was as seriously below what it really would have been. Even if both these catchwater schemes for securing a soft water supply were executed at any cost, they could not furnish the quantity required for the enormous population of London. At the rate of the Liverpool and of the Manchester water-works, where the rain-fall is greatly in excess of that of London, it would require gathering-grounds in the proportion of about 25 acres per 100 individuals; or, for the supply of the metropolis, it would require not less than 1000 square miles, or about 1-6th of the total estimated water-shed of the Thames; and it is preposterous to suppose that, under any conditions of springs fed from other sources, the districts it has been proposed to resort to could yield anything approaching the volume which would be required. As it is, the abstraction of fresh water from the Thames, is in dry seasons becoming an evil of serious magnitude to the navigation, even when the New River, the East London, and the Kent water-works companies, derive their supplies from other sources than the Thames. What would be the case, if the whole of the 100,000,000 millions of gallons, now supposed to be consumed every day in London, were withdrawn from the basin of the Upper Thames? It must indeed be observed that, if there be any real value in the opinion, as to the hygienic superiority of the pure soft water, the whole of the town supply must be of that description, unless the new source be resorted to, simply as the basis of a scheme in opposition to the companies already in possession of the supply. Far be it from me to prejudge the question as to the necessity of any such opposition. All I seek at present to show is, that so far as regards the quality of the water supplied to London, there is no immediate reason for a change, and that there are as many objections to be raised to the qualities of the model municipal supplies, as there are to the unjustly attacked waters, distributed by the London water companies.

In the year 1856, a series of articles, under the head of "Visits to the London Water-Works," appeared in the JOURNAL OF GAS LIGHTING AND WATER SUPPLY; and in the same year, a report to Mr. Cowper, President of the General Board of Health, was published, in both of which an account was given of the works executed by the metropolitan water-works, in compliance with the requirements of the Metropolis Water Act, 1852. At the date of the publication of those documents, nearly all that had been contemplated for the alteration and improvement of the existing system of supply had been completed, and since then little else has been done beyond the extension of the distribution into the continually-extending suburbs of our marvellous agglomeration of houses, and some trifling modifications of the machinery required to meet the wants of some outlying districts. Perhaps the most remarkable events which have taken place since 1856, in the history of the London water supply, have been the completion of the works on the New River at Hornsey; the sinking of the new wells at the Kent Water-Works; and the utter failure of the Woolwich and Plumstead Company, from a combination of circumstances, into which it is not my province to enter. The results of the very costly, and very equivocally successful, experiments at Orange Street and at Duck Island, have in nowise affected the question of the metropolitan water supply; and the schemes for supplying the extreme east of London from Grays, or the extreme south-east from the Cray or the Darent, remain still in the state of projects: the Hampstead Company, as was before said, has been merged into the New River Company. At the present day, then, the companies which supply the metropolis are—1, New River; 2, East London; 3, Southwark and Vauxhall; 4, Lambeth; 5, West Middlesex; 6, Chelsea; 7, Grand Junction; and 8, Kent. The capital embarked in these undertakings is enormous. From the returns to the General Board of Health, it seems that the total cost, up to 1856, had not been less than £7,102,823; and at the present day it cannot be much below 7½ millions. In 1856, the aggregate nominal steam power employed was not less than 7254 horses, and the quantity of water pumped was 81,025,842 gallons per day on the average of the year. Nor would it be unfair to suppose that, in consequence of the increase of population since the date of these returns, that the present rate of supply must be nearly 100,000,000 gallons per day; or at the rate of about 40 gallons per head of the inhabitants. A service of this character cannot be lightly disturbed, and it behoves our rulers to observe especial caution in the manner in which they allow their agents to create feelings of dissatisfaction with a class of public contractors who have risked so much, and have laboured so earnestly, to discharge the duty they have undertaken. Perhaps the best proof of the earnestness with which the London companies have entered upon their task is to be found in the fact that they have spent no less than 2½ millions sterling for the removal of their sources of supply, for the filtration of their waters, and for the improvement of their distribution since the year 1852.

Before closing these remarks, I cannot refrain from saying that the inhabitants of London have been very far from seconding either the intentions of the Legislature in passing the Act of 1852, or the water companies in their attempts to improve the quality of the supply. The Legislature, unquestionably, intended (whether rightly or wrongly) to facilitate the introduction of the constant service, as it is called, into London; and the companies have executed all the works incumbent upon them for that purpose. For my own part, I believe that the provisions in the Act of 1852 on this subject must always remain a dead letter; because the substitution of the machinery required for a distribution on the constant supply, for one upon the present intermittent supply, would involve an outlay on the part of the public equivalent to between £5 and £10 per house. Moreover, the waste of water upon the constant supply in a town like London—if it attained anything like the proportions it has done at New York and Boston—would instantly compel the adoption of measures to limit the rate of supply. Practically, I believe that the distribution of water in London must continue to take place as it does at the present day; but, so long as this is the case, so long does it behove the London public to exercise a rigid superintendence over the machinery of distribution which is under their own control. It is in vain to change the sources of supply for the purpose of avoiding organic impurity; it is useless to filter the water and store it in covered reservoirs, if, directly that water enters the houses it is intended to serve, it is poured into cisterns which are not cleaned out from year's end to year's end, or into butts teeming with every description of organic and inorganic impurities. In this matter, as in many others connected with social and hygienic science, the public requires to be taught that the remedy for the most pressing of their evils lies in their own hands, and if the householders of London would only clean out their cisterns once a month—at least once every three months—we should hear very little of the "total impurity per gallon" of the London waters. As it is, people who are not accustomed to think on these matters are apt to forget the real proportions of the impurity said to be present in those waters, and the public requires to be reminded that 22 grains per gallon only mean 1 grain in about 3182 grains; and that 1·4 grains of organic impurity of all kinds only mean 1 grain in 50,000. If these impurities be poisons, they may be suspected to be slow poisons of the kind Fontenelle could, at the age of 80, afford to jest about, as he had taken them every day of his life, and we Londoners have an unfortunate habit "of persevering in living" under their effects.

It may be worth while to add that the average cost of the London water supply does not exceed 5 per cent. on the rental, for a distribution so copious as to attain the rate of 40 gallons per head per day, or nearly seven times as much as it ought to be, for, in fact, no one really uses much more than 6 gallons per day. They only who take the water pay for it, and the trading companies who supply the public are obliged to suffer all risks, and to contribute very largely to all public burthens in the shape of rates and taxes; for instance, the assessments of the water companies to the poor-rates vary between 9 and 32½ per cent. of their total rentals; and moreover, they are, by the very necessities of their position, compelled to adopt every improvement in mechanical or chemical science as it arises. A very long discussion might be raised upon this part of the political economy of the discharge of municipal services, but it may suffice here to say, that the experience furnished by the management of the Manchester Gas-Works, and of the Southampton Water-Works, shows that wherever municipal bodies take upon themselves the discharge of functions which must be paid for in some way or other, there is a great danger, firstly, that there will be injustice in the assessment of the payment; and, secondly, that in the mode of working there may be extravagance, even if not abuse. The modern system of paying for the deficiencies in municipal budgets, occasioned by the inadequate charges for gas and water-rents, by means of general and district rates, is, after all, only a disguised method of making the community at large pay a portion of the burthen the consumers alone should bear. The system adopted in London, where they

only who receive a benefit pay for it, is certainly the fairest one, and, in the end, past experience has proved that is the cheapest.

The conclusions I am induced to draw from a careful study of the question of the present condition of the London water supply, are as follows:—

1st, I think that the quality of the water is, on the whole, extremely good, and that the companies take every precaution in their power to maintain its character.

2nd, I am convinced that it is utterly impossible to secure a supply which should attain the supposed ideal type, even if that were desirable, which I do not believe.

3rd, I think that the greatest present improvement in the quality of the London waters would be effected by rendering it impossible for the population on the banks of the upper Thames and its affluents to use the river as their outfall sewers. With all the local impurities thus cast into the Thames, the quantity of organic matters its waters contain do not, however, exceed in any notable quantity those contained in deep-seated chalk springs which cannot possibly receive sewerage.

4th, It seems to me that any extension of our present supplies should be sought for rather on the east than on the west of London, and on the edges of some of the great lines of disturbance there existing.

5th, It seems also to me that it would be a mere waste of money to attempt to execute any system of catchwater supply.

6th, and lastly, I think that there is both great injustice and great want of a true spirit of philosophy, in the insinuations which are now constantly urged by the Registrar-General on the subject of the impurity of the London waters. Pure water does not exist in nature, for even rain-water contains appreciable quantities of ammonia; thus, Barral states that the rain-water of Paris contains about 3 in 100,000 of organic impurity; and the well of Grenelle yields a water containing about 15 in 100,000 of impurity of every kind; but, even if pure water could be obtained, it would be necessary to ascertain the precise nature and effects of the extraneous matters, in any other definite water supply, before applying to those matters the term *impurities*. The Registrar-General's monthly reports, moreover, not being drawn up with the assistance of the officers of the companies, can only be regarded as *ex-parte* statements by one who evidently has a strong bias against the companies or their sources of supply.

DISCUSSION.

Mr. S. C. Homersham said he felt called upon to dispute some of the statements put forward in the paper as facts. To his great surprise, Mr. Burnell had stated that the Plumstead Water-works Company was defunct. The Plumstead Water-Works Company was established in 1852, was opened in 1854, and had remained so till the present day. They had never for an hour ceased to supply their customers, and they had an increasing nnmber of customers every year since the works were opened. That was a fact which might easily have been ascertained by Mr. Burnell, and he would have found, upon inquiry, that the water of the company was now supplied to 3400 houses. It was true that at one time there were disputes between the directors on the question of building the works upon leasehold ground, &c., and a Chancery suit, and other legal proceedings, had ensued in consequence; but that had never affected the water supply to the public. The well had been sunk, in the first instance, to yield 600,000 gallons per day; and, as the tenants of the company increased, in order to increase the supply, a bore-hole, 18 inches diameter, was put down, from which a further yield to the same extent, making 1,200,000 gallons per day, had been obtained. He was, therefore, much surprised at the statement in the paper that would lead them to believe the Plumstead Water Company had ceased to exist. Mr. Burnell had alluded to the softening process adopted by Dr. Clark, and stated that the water injuriously affected the lead service-pipes. Now, he (Mr. Homersham), as engineer of the company, was enabled to state that the water did not act upon the lead in the least degree; that it was supplied to 3400 houses, in almost every case through leaden pipes, and that he had never heard of any complaint, except in one case, in which the lead used for a cistern was of such bad quality that the contractor, to save his own credit, had put up another tank at his own expense. He could, therefore, confidently state that, in the case of the Plumstead water, there was no foundation for the statement that the water acted perniciously upon the leaden pipes and cisterns through which it was conducted and stored in the houses of the consumers. Pure, soft, spring water, free from organic matter, or free from carbonic acid, had no action upon lead; and such was the spring water supplied by the Plumstead Water Company. Dr. Clark, in his paper read before this society in 1856, expressly stated that softened chalk spring water had no action upon lead. A series of tests upon such water had been made, which proved that the softened spring water had no action upon lead. With regard to the general water supply of London, Mr. Burnell had characterized it as very good; that chemists could only detect so small an amount of organic matter in the water that it was immaterial whether it existed or not. That statement accorded with the opinion given in 1849 by Sir William Clay, chairman of the Grand Junction Water-Works; but Mr. J. Simon, who presided over the meeting of this society when Dr. Clark read his paper, showed the deleterious action which water containing organic impurities had upon the inhabitants of a large district of the metropolis, giving the facts taken from an authorized investigation into the subject after the last visit of the cholera.* That was a comparison, not between pure water and contaminated water of a district, but between waters more or less contaminated by town drainage; and yet chemists told them that such water contained next to nothing of organic matter. Therefore, he considered these chemical tests as to organic matter in water went for very little. Microscopic examination showed that there were all sorts of animalculæ, and all sorts of impurity in the river-water, whilst none at all existed in the spring-water. One great objection to the water supply of the present companies was that the drainage of a large urban population was carried into the Thames, from whence the supply was taken. He believed there was a population of 700,000 upon that drainage ground. The water was also polluted by the manure put upon the land, and also by the barges going up and down the river, and various other influences. In addition to this, it was to be remarked, that river-water in summer time was heated, whilst in winter it was excessively cold. The temperature of the rain water in summer was sometimes as high or higher than 72°, and in the winter it was as low as 33° or 34° Fahr. That was not desirable in a town supply of water, because the mere raising of the temperature of the water deprived it of a large portion of oxygen gas, and caused the fermentation of any fetid matter it might contain. On the other hand, the water froze very easily in the pipes in the winter. Now, with regard to spring water, it was taken from the well at 49° or 50° of temperature in summer, and supplied at only 2° or 3° higher temperature, whilst in winter it was only 2° or 3° colder than when taken from the well. That, he considered, was an important circumstance, and especially in the matter of drainage. If they put water through the drains of houses at 51° or 52° of temperature instead of at 72°, it was better for the sewerage and for the health of the inhabitants. It had been stated in the paper that certain impurities in the water supply of London were pointed to in the Registrar-General's returns, but that no analysis was given as to the quality of the water. Upon that point, however, they had the able analyses of Dr. Hassall. Mr. Burnell had advanced an opinion before this meeting that it was questionable whether they would get a better supply of water than they had at present. Now, he (Mr. Homersham), ventured to say that, at a comparatively small expense, London might be supplied with 100 million gallons of spring water per day, containing only 2° or 3° of hardness, and free from all unwholesome matter; and why had not this been done before? Simply, because the Government interfered between the consumers of water and the companies, and prevented a supply being brought into London from the chalk springs. The idea of a supply of water from the chalk was at one time ridiculed; but he might state that the Kent Water Company, seeing the success of the Plumstead works in 1854, with which company they were in competition, had since sunk a well in the chalk, from which they obtained 1½ million gallons per day, and had subsequently sunk two other wells, the three yielding 3½ million gallons per day, so that at the present time they derived all their supply from chalk wells, whereas a few years ago they had ridiculed the idea of getting a supply from the chalk springs. That was the effect of free competition. Mr. Burnell had alluded to the Trafalgar Square wells, as an instance in support of his assertion that the level of the water under London had gradually been lowered; but he (Mr. Homersham) would say, that whilst it was true that the water in some of the large wells of London had been lowered, the Trafalgar Square well, which had been pumped from the last 18 or 19 years, stood just as it did formerly; and the same remark might be made as to the wells of the Kent Water Company and the Plumpstead Company, to which he had alluded, as well as very many others. He thought such statements were calculated to mislead the public as to the possibility of obtaining a supply of water for London from the chalk. He would undertake to find a contractor who, at a reasonable price, should furnish a practically unlimited supply of water from the chalk, free from impure organic matter, at a temperature of about 50°, and soften this water to only two or three degrees of hardness. He Mr. (Homersham) had gone fully into the question of the quantity of water to be obtained from the chalk in his paper read before the society on Feb. 2, 1852.*

Mr. J. T. Bateman, F.R.S., as the engineer of the Loch Katrine or Glasgow Water-Works, and also of the Manchester Water-Works, felt considerable interest in this subject. He was a great advocate for pure soft water. Mr. Burnell had alluded to the reports of the Registrar-General, and had remarked upon the uniformity of the analyses, during the months of October, November, and December, of the waters of Loch Katrine and the Manchester Water-Works. He believed he could satisfactorily explain that circumstance. The analysis of the water of Loch Katrine was first made in 1854, at the time when a great outcry was made upon the subject of soft water supply, in consequence of the alleged action of such waters upon lead pipes. The water of Loch Katrine varied very little in quality in summer and winter, and it was generally regarded as the type of a good water supply. He was, therefore, anxious that old analyses of that water should not be relied upon, but that the test should be applied to the water as delivered in Glasgow after the works were completed. He therefore sent up a supply of the water from Glasgow from time to time, in order that analyses might be taken of the water as delivered for the use of the inhabitants of that city, and not of the water as taken directly from Loch Katrine. Samples of the water of Manchester were sent in a similar way at various times, at intervals of two or three months, and of that water analyses had also appeared. It made very little difference whether these analyses were repeated once a month or once in a year, for there was, in point of fact, very little variation indeed. He had the results of the analysis of the Manchester water, made in 1844, by Professors Miller, Penny, and Redwood, from which it was shown that there were 3·6 grains of total impurity per gallon, 1 grain of organic impurity, and 1½° of hardness in the water supplied to Manchester, and the analyses since that time varied very little, as would be seen by those referred to by Mr. Burnell. The water of Loch Katrine was received into immense basins, 700 or 800 feet in depth; and the vast body of water thus collected might be conceived from the fact that, during the late most severe weather, when Loch Vennachar was completely frozen over, as well as the lower part of Loch Lomond, the temperature of the air being 12° or 14° below zero, there was not an atom of ice on Loch Katrine, and the water, after travelling through the bowels of the earth for a distance of twenty-seven miles, to the service-reservoir, near Glasgow, gained 2° of temperature, and was delivered at the end of the tunnel, at 41° of temperature in the coldest weather; in fact, all along the line of aqueduct warm air was emitted from the shafts of the tunnels, and the vapour there condensed, like steam from a locomotive engine, all along the hills under which the water travelled. In the case of Manchester, the water was, for the most part, taken direct from the springs, without being stored in reservoirs, which were only resorted to in the event of a short supply. The daily supply of pure spring water at the Manchester Water-Works varied from six or seven million gallons to thirty millions. The supply to the city might be taken at eleven million gallons per day, tenelevenths of which were spring water. That accounted for the uniformity in the quality of the water there. Mr. Burnell had made some remarks upon the desirability of the presence of bicarbonate of lime in the water; that was supporting the old theory, that it was necessary to drink hard water for the production of bone in the human frame. Now, he would remark, as the result of his personal observation, that the finest men in Great Britain were those who lived in districts where no hard water could be obtained; there they had the largest-boned specimens of human beings. In Aberdeen and the east coast of Scotland, and in the granite districts generally, they had no bicarbonate of lime in their water, and finer men he had never seen; and the same remark equally applied to the lowlands of Scotland, about Melrose, and to the Cumberland and Westmoreland lake districts. There they had no hard water at all. In Wiltshire and Dorsetshire, which were chalk or lime districts, they found perhaps the smallest-boned specimens of humanity that were to be met with all over the country. He believed it was better, on all accounts, to have soft water without any lime. Another consideration with regard to hard water was its cost. He had, on a recent occasion, gone into a calculation of the saving which was effected to Glasgow from being supplied with soft water. The water of the Clyde, from which the supply was previously taken, contained from seven to nine degrees of hardness; and, since the supply of soft water had been furnished, there was a saving in large printing and bleaching establishments of fully one-half in the article of soap alone. In fact, in some cases, the saving had been equal to five-eighths; for, since the water of Loch Katrine had been supplied, it

* Vide Dr. Clark's Paper and Discussion thereon. *Society of Arts Journal*, vol. iv., p. 439.

* See *Society of Arts Journal*, vol. 3, p. 168.

had been found that three boxes of soap were equal to eight boxes formerly, and the work was done better with the diminished quantity. In fact, the saving from all causes, from the use of soft water, was £40,000 a year, and paid the water-rates of that portion of the city in which the change had taken place. It was equal to a free gift to the city of £1,000,000. In the case of London, a supply of similarly soft water, taking into account the greater hardness of the present supply, would be equal to a free gift to the City of £10,000 sterling. With regard to the action of soft water upon lead, an investigation, of a very complete and expensive character, into that matter had been made at Glasgow. When the main difficulties in the supply of water from the loch were got over, they were astonished to find that some samples of water were produced before the parliamentary committee, as showing the effects of the action of soft water upon leaden pipes. The town of Inverness had been, for twenty-seven years, at that time, supplied with water from Loch Ness through services of lead and wood cisterns, with an intermittent supply, and yet no case of lead disease had ever been heard of; and he had had in his possession, for the last seven years, portions of pipes which were beautifully coated with bicarbonate of lime, carbonate of lead, or some other substance of that kind, which perfectly protected the water from any injurious effects of the lead. To take another case, Whitehaven was formerly supplied with hard water, which was changed for a soft water supply from Ennerdale Lake. The mortality returns for four years previous to the introduction of soft water showed an average of 35 deaths per 1000, whilst upon a supply of soft water being furnished to that town, the average of the following four years showed that the mortality was reduced to 23 in the thousand. Amongst other subjects alluded to in the paper, was that of the management of those matters by corporations, and Mr. Burnell had referred to two cases especially—viz., the Manchester Gas-Works and the Southampton Water-Works. Now, the former, so far from being an example of bad management, was one of the most lucrative concerns ever adopted by a public body. It was an arrangement by which the township of Manchester had established its own gas-works, and, while supplying excellent gas, had gained a sufficient amount of profit to be enabled to expend more than half a million of money in the public improvements of the town; and in the case of Glasgow, he might add that the results of carrying out the same system of management by a corporation, had been the improvement of the navigation of the Clyde from a depth of water of three feet and annual dues amounting to £300, to 22 feet depth, and a revenue of upwards of £90,000 per annum.

Mr. LOTT said that Mr. Burnell had reproached the public of London with apathy upon the matter of the water supply. There was something more than apathy—there was disgust felt at that legislation which had given rise to the present monopoly of the water supply, and which enabled the existing water companies to increase their charges to 15 per cent., a power they were not slow to avail themselves of. It was a public misfortune that the splendid legacy bequeathed by Sir Hugh Myddelton to his fellow-citizens had led to the formation of a private company, whose profits were almost fabulous, whilst it held despotic sway over the water supply in the district. The remark had been made that the Camden Town Water-Works Company had been compelled to merge their concern into that of the New River Company. The plain history of that matter was, that when the Camden Town Company had a short supply of water, they applied to the New River Company for assistance, and the latter made it a condition of their assistance that the former should give up some of their districts, until gradually the Camden Town were compelled to give up district after district, until the New River Company got all the streets into their own hands. He was, however, happy to say that, in his place in the corporation, he was the means of arresting for a time the death-struggles of the Hampstead Water Company, inasmuch as upon their applying to the corporation for a renewal of their lease of some lands at Highgate, which were the property of the corporation, from which they obtained their supply, the payment of a very large sum was fixed by the surveyor as the condition of the renewal; but, feeling sympathy for the company in its misfortunes, and being a decided opponent to monopoly, he succeeded in inducing the corporation to grant a renewal of the lease upon terms that were almost nominal. In 1835, a great question was raised with regard both to the quantity and quality of the supply of the New River Company; and, having employed a chemist to make an analysis of the water, he brought the matter before the attention of the corporation. Some of the governors of the company attended before the corporation on that occasion, and the result was a considerable improvement both in the quantity and quality of the water. That was the way they were obliged to watch these companies. He would say one word with regard to municipal bodies failing in the management of these matters. It was too much the fashion in the present day to abuse these corporations. For his own part, he would say he very much regretted that the corporation of London had not taken the matter of water supply into their own hands. If there was a profit to be made out of it, he believed they would have been as successful in that respect as the corporation of Manchester had been in the case of gas; and the profits so made would have gone in aid of the public rates.

Professor TENNANT inquired of Mr. Bateman, from what formation the water of Manchester was principally obtained?

Mr. BATEMAN replied from the millstone grit.

Mr. SPENCER understood Mr. Bateman to state that the profits from the Manchester water supply went in aid of the gas supply of the same town.

Mr. BATEMAN replied that the case was just the reverse. Half the profits of the gas went in reduction of the water-rates. The present water-rate was 6d. in the pound, supplemented by half the profits from the gas.

Mr. SPENCER would add, with regard to the action of soft water upon lead, that during the time he was engaged at Glasgow in the investigation of that question, he visited Whitehaven, which was distinguished by having softer water than almost any other town in the kingdom, and he could state, as the result of the investigation by some of the most eminent chemists of the day, that no perceptible action had taken place upon the lead pipes there. In that case, the water was below 1° of hardness. Some time subsequent to that, he was called upon to make an examination as to the corrosion of water-pipes, and, supposing it to be a case analogous to that of Whitehaven, he procured some pieces of the lead pipes. He would, in the first instance, state that the water was very soft, and corroded the iron main pipes to such an extent, that the delivery of 6-inch pipes was reduced to the quantity that would be given through 3-inch pipes, owing to the extent to which corrosion and deposit had gone on, and in some portions of the town, the supply was partially stopped. But on examining the leaden pipes, he found there was a very beautiful coating of carbonate of iron in the interior; hence, if it had not been for the action of the water upon the iron piping, there was no doubt there would have been corrosion of the lead. The report upon the subject was, that the health of the inhabitants had been saved at the expense of the iron pipes. He did not say that they ought not to have gone to Loch Katrine for their water—he thought it was the best thing they could do; but he said, until the pipes became coated in the way he had described, with some deposit from the water, the water of Loch Katrine was calculated to have an action upon the lead.

Mr. FRED. BRAITHWAITE remarked that the question of water supply to the metropolis was a very serious one, and might with propriety be discussed before this society; at the same time, he thought they ought to be careful how they disturbed the minds of so vast a population as to the quantity and quality of the water with which they were supplied at the present time. It must be admitted that the great source of supply at this moment was from the river Thames. The Government, some years ago, very carefully investigated this question, and insisted upon the various water companies taking their supply from the river beyond Teddington Lock, where it was as free as possible from contamination; and, if they looked at the water which was now supplied, they would find that they had water quite sufficiently pure. It was stated, upon analysis, to contain a certain number of grains of impurity per gallon—carbonate of lime being considered an impurity. Hypothetically distilled water only was pure, and one grain of carbonate of lime might thus be called an impurity; but could this be considered really an impurity? A gallon of water contained 70,000 grains, and analysis had shown that 1½ grain, or at most 2 grains, of organic impurity existed in that number of grains. He was, therefore, anxious that they should not create in the public mind an alarm that at the present time the supply of water to London was of a nature injurious to health. It was true that the water alluded to by Mr. Homersham, derived from chalk springs, was of a very soft character, with an absence of organic matter which was found in other water; but, in that case, Dr. Clark's system was employed to precipitate the carbonate of lime; such a plan, however, he thought was impracticable in a commercial sense, and he would ask Mr. Homersham whether the result was commercially profitable in the case of the Plumstead Water-Works?

Mr. HOMERSHAM replied that the net profits of the company amounted to £3700 last year.

Mr. BRAITHWAITE was, nevertheless, inclined to doubt the commercial success of the undertaking. The great question was, was there any town in the kingdom supplied with so large a quantity of water, of such purity, and at such a price, as London? The supply was estimated at 40 gallons per head daily—a far greater quantity than was fairly required. He had no hesitation in saying that, if last summer they had had a season of dry weather like that of the previous year, London would not have had the supply of water it required, for they had scarcely a gallon of water flowing over Teddington Lock during the summer of 1859. During the last year, they had a more abundant supply, the rainfall having been about twelve inches beyond the average. They had now abundance of water in the Thames above the lock, and the river had not been in a better condition for the last thirty years than it was at the present time.

Mr. WM. HAWES said that, judging from the papers which had lately been read before the society, he had expected to see the walls of the room covered with diagrams representing the fearful amount of pollution infecting the water supply of London, with microscopic illustrations of that pollution, tending to show that the inhabitants of London, in addition to injury from adulterated food, were liable to be poisoned with the polluted water which they were obliged to drink. This discussion had shown that, notwithstanding all the alleged impurity of the water of London, the amount of the impurity was so infinitesimally small, that they might go on drinking it without undue alarm as to any injurious effects upon their health. It was important exaggerated statements should not be put forward. They had been told that in districts where this fine soft water was alone drunk, the finest specimens of humanity were to be met with. That might be quite true in the abstract; but, on the other hand, if they went to those countries where only the purest (so called) water, the snow water was drunk, as in Switzerland, they found the most diseased population perhaps in all Europe, who were characterized by the great prevalence of goitre amongst them. Isolated cases were not to be relied upon. He thought they might undoubtedly appeal to the general health of the city of London as the best proof that they were on the whole well supplied with what they ate and drank. They were told that the charges for water supply in London were exorbitant—those of the New River Company in particular. If they took the West End of London, for example, he believed the average rate of charge was from four to five guineas per annum for such houses as were found in the squares north of Oxford Street. He thought that could not be called an enormous charge for water. The New River Company was commenced very many years ago, when London was comparatively small in extent, and the demand for water had gone on rapidly increasing. The supply, as far as the New River Company was concerned, was at one time limited, but now the case was different, and the accumulated profits of the undertaking had put the original shareholders into a position to make very large profits upon the early nominal capital. They were told that the corporations of Glasgow and Manchester were types of perfection in these matters of supply of gas and water; but did they wish to have the supply of the necessaries of life placed in the hands of corporations? Was the corporation the power to which they would wish to intrust the supply of this great city with those necessary commodities? He contended that the best means of supplying a great city like London was through the agency of great public companies and commercial firms, under the vigilant eye of the public. That was, in his opinion, the best as well as the cheapest way of getting a supply of those articles which every large city required.

Dr. WYLD remarked that it had been advanced by some speakers that evening, that they could not have a better supply of water for London than that which was derived from the Thames. He could only state that during a residence last summer at Kingston, he found the water of the Thames opposite that town in a most offensive state. He quite agreed with the recommendation given by Mr. Burnell, to look to the state of their cisterns. As a matter of personal experience, he could state that, having been without water at his residence for some time during the late frost, the opportunity was taken to inspect the state of the cistern in his kitchen, when there was found to be at the bottom an inch in thickness of foul, slimy matter. This showed the importance of having the cistern periodically cleaned.

Mr. A. S. HARRISON was able to state, from his personal experience as a practical plumber in the City of London, that very great negligence prevailed with regard to the cleansing of the cisterns; and instances were of very frequent occurrence in which large quantities of filthy matter had been suffered to accumulate at the bottoms of tanks. The deposit itself resembled lime mixed with a yellow-coloured matter, and he concluded that it consisted principally of the lime deposited from the water, coloured by the rust of the iron pipes through which it passed. He had taken up some miles of pipes in the City, and he invariably found that they were covered with a thin coating, which he presumed was lime, which was easily removable with the finger, but which the passage of the water itself was not able to remove. With regard to leadern cisterns, he believed that injury frequently arose from a galvanic action taking place between the lead and the solder connecting the bottom and sides of the cistern, as it was at those parts that any failure usually took place. With regard to the supply of

water to London, he was in favour of constant service and supply through meter. In Billingsgate Market, and other places where very large quantities of water were used, that system had been adopted with satisfactory results both to the consumers and to the companies supplying the water.

The CHAIRMAN, in asking the permission of the meeting to present to Mr. Burnell their thanks for his paper, would offer only one or two remarks. The discussions of this Society, useful as they were, were sometimes of a somewhat discursive character, and certainly they had had that evening topics which were not quite pertinent to the subject before them. Mr. Bateman, in a very interesting description of the water supply of Glasgow and Manchester, had sought to claim the large and sinewy frames of some of his Scotch friends as the products of soft water, whilst he had pointed to the feeble and degenerate growth of some of our Southern people, as the unfortunate results of hard water. If the paper, which had been read that evening painted in too favourable colours the water supply of the metropolis, the reverse of the picture had been offered to them by Mr. Homersham and other speakers, in terms not over flattering to the water companies. Much of the value of these meetings of the Society arose from the freedom of discussion which prevailed in this room, and that corrections which exaggerated statements, were thus sure to receive. Notwithstanding all they had heard, he hoped the audience would go away with no great amount of discomfort, from the fear that they would not have a sufficient supply of good water for their use during the year 1861. He must confess, he went very far with Mr. Hawes in the distaste that gentleman had expressed against too much interference in these matters, on the part of municipal bodies. The great characteristic of the English people was, that they relied upon themselves, and if they did not get everything absolutely perfect, they had the satisfaction of knowing that, in providing for their wants by their own independent agency, those habits of self-reliance were formed by which as a nation we were especially characterized. He was, therefore, sure he should have the unanimous sanction of the meeting to a vote of thanks to Mr. Burnell for his paper.

GLASGOW GASLIGHT COMPANY.

REPORT OF THE ACCOUNTANT APPOINTED BY THE TOWN COUNCIL TO EXAMINE INTO ITS AFFAIRS AND MANAGEMENT.

On the 5th of July, 1860, the accountant received from the town-clerk of Glasgow, a copy of the following minute extracted from the minute book of the committee of the Town Council on gas:—

In terms of remit by the council and authority granted in their minute of the 7th ultimo, the committee hereby authorize and request James M'Clelland, accountant (with consent of the Glasgow Gaslight Company, which has already been obtained through their manager, Mr. Ritchie), to make an investigation of the books of said company, embracing the last two years of the management, and to produce a report of his investigation showing the gross revenue of the company; the sums divided among the shareholders, or laid aside by way of rest, contingent-fund, or otherwise; also the expenditure for the same period, and the details thereof in branches—such as expenses of repairs, and improvements of new works, or extension of works, &c., and generally such particulars as will enable the committee to judge whether the disposal of the funds of the company has been in accordance with their various Acts of Parliament, so far as the public are interested.

On this minute being submitted to the manager of the Glasgow Gaslight Company, it appeared there was a misunderstanding as to the period over which the investigation required should extend—the gas company thinking that it had been arranged that the investigation should embrace the two years ending the 31st of May, 1859, and not the two years to the 31st of May, 1860. The propriety of bringing down the inquiry to the date of the last balance on the 31st of May, 1860, was, however, submitted to the gas company, who at once acceded to the suggestion. The report will, therefore, embrace an examination of the affairs of the company for the three years from the 31st of May, 1857, to the 31st of May, 1860.

The accountant has obtained free acess to the books, vouchers, and other papers of the company, and he has called for and obtained information on those points which seem to require explanation. He begs leave to report that he has examined the books of the company, which consist of—

1. Ledgers for various districts, containing a record of the gas used by each consumer of gas whose consumption is indicated by meter.
2. Books containing a record of those consumers who pay by contract.
3. Collectors books, showing the daily collections of gas rates in different districts; and abstract book, showing the daily collections from all the districts.
4. General cash book, day book, journal, and ledger for the capital, revenue, and other accounts of the general business of the company.

The accountant has compared the entries in the general cash book with the vouchers, pay bills, and bank book, and he has found these entries sufficiently vouched and instructed. The district ledgers are very voluminous, and enter into immense details. Without very great labour and expense, it would have been impossible to have certified the exact accuracy of the statements in these books; but the accountant has tested their accuracy at various points in the several years recorded, and sees no reason to doubt the entire accuracy of the whole. The additions of the cash book, journal, and ledger, and the balances on the capital and revenue accounts, have also been checked and found to be correctly stated.

Before proceeding to give the results of the investigation now made, the accountant will refer to those portions of the Acts of Parliament under which the company was constituted and authorized to create shares, to raise money on mortgage, or otherwise, and to set aside certain sums for a contingent or reserve-fund.

The Glasgow Gaslight Company was incorporated by Act of Parliament, 57th, George III., c. 41 (16th of June, 1817), and authorized to raise a sum not exceeding £40,000 for the purposes of the undertaking. It was provided that the sum raised should be shares of £25 each, and that a sum sanctioned by the committee of management, being not less than £2000, nor more than £3000, should be set aside out of the company's profits to answer contingencies, and lodged in bank, or invested in Government securities. Power was also given by this Act to borrow money to the extent of £10,000.

By the Act 3rd, George IV., c. 80 (24th of June 1822), the company was authorized to raise additional capital, not exceeding in the whole the farther sum of £40,000, to be divided into shares of £25 each. It was further provided by this Act that, in place of the sum ordered under the Act 57th, George III., c. 41, to be set aside to answer contingencies, the committee of management should invest not less than £5000 to meet contingencies, either out of the profits to arise from the said undertaking, or out of the money to be raised from the subscribers to the stock created by the 3rd, George IV., c. 86. It was farther provided that the sum so set apart should be deposited in bank, or invested in Government securities, or lent out upon real securities: the dividends or interest thereof, as well as the yearly profits of the undertaking, to be be divided among the shareholders.

The Act 6th George IV., c. 35 (2nd May, 1825), authorized the company again to raise fresh capital, not exceeding in the whole £20,000, and provided that this sum should be raised by shares of £6. 5s. each. By this Act, the annual dividends on the whole shares created under former statutes, including those raised under this Act, were limited to a return on the stock of 10 per cent. per annum.

By the Act 7th George IV., c. 38 (11th April, 1826), the company were empowered to raise a farther sum by sale of shares, it being a condition of the powers that the shares so to be disposed of should not exceed in the whole the number of 2000, at £25 each, or £50,000. It was provided that these shares should be put up to public sale before being disposed of by private bargain, the dividend thereon being also limited to 10 per cent. It was also provided that, after deducting expenses of sale and of obtaining the Act, the proceeds of the stock sold should be laid out on the works, and that no part of the price realized from the public, exceeding £25 per share, should be paid to the proprietors.

The company seem for a considerable period to have leant on the resources created under the forenamed Acts, for it is found that they deemed it unnecessary to have again recourse to Parliament till the session of 1857, when the Act of 20th and 21st Victoria, c. 35, under which the affairs of the company are now consolidated, was passed into law. This Act proceeds on the narrative that the company had, under former statutes, raised £150,000 of share capital, and £49,724. 16s. of premiums by the sale of the 2000 shares created under the Act 7th George IV., c. 38, and that they were indebted in a sum exceeding £10,000 authorized to be borrowed under the Act 57th George III., c. 41, and that they had expended on the works a sum of £29,104. 13s. 5d. out of the profits divisible among the shareholders, and that it was expedient the company should be authorized to extend their undertaking.

The company is by this Act empowered—

1. To create and sell new shares, not exceeding the number of 2600, of £25 each, or £65,000, limiting the maximum dividend to 10 per cent. on the shares previously created, and to 7½ per cent. on those to be created under the new powers.
2. To raise, on bond or mortgage, any sum or sums which, including any sums already borrowed, or the portions thereof from time to time remaining unpaid, shall not in the whole exceed £50,000.
3. After the creation and sale of the new shares, and one-half of the price thereof has been paid up, authority is given to borrow a farther sum or sums not exceeding £20,000.
4. The whole money to be raised by the creation and sale of shares, and by borrowing upon mortgage or bond, is to be applied for the purposes of the Act, including repayment of any sums borrowed previously to the passing of the Act.
5. It is, however, provided that £29,104. 13s. 5d., being the amount before referred to as expended out of the profits, may be set aside, invested, and form a reserve-fund, out of which the company shall be entitled, from time to time, to pay any deficiency which may accrue in the maximum dividend, and any extraordinary claims or demands which may arise against them.
6. Should this fund be at any time reduced, the statute gives the company power again to restore it out of the profits of the company, so as to keep in all time coming the reserve at the maximum named in the Act.

The share capital of the company, raised in terms of the Acts of Parliament above quoted, is as follows:—

1. Under provisions of the original Act, 57th Geo. III., c. 41 . .	£40,000	0	0
2. ,, ,, of 3rd Geo. IV., c. 80	40,000	0	0
3. ,, ,, of 6th Geo. IV., c. 35	20,000	0	0
4. ,, ,, of 7th Geo. IV., c. 38	50,000	0	0
Besides the above, the company received premiums on the shares £50,000, created and sold under the 7th Geo. IV., c. 38, amounting to	49,724	16	0
Making the share and bonus capital	£199,724	16	0
Under the powers given to them by the 20th and 21st Victoria, c. 35, the company have hitherto refrained from raising a farther amount of share capital. They have, however, exercised their powers of borrowing on mortgage to the extent of	50,000	0	0
And have borrowed from their bankers and the public	19,210	19	4
Making the total resources of the company amount to	£268,935	15	4

The accountant finds that, in reference to the Act 3rd Geo. IV., c. 80, the obligation on the company to invest the contingent-fund of £5000 has been complied with, that sum being held in Government New 3 per Cents. But the provision in the Act 20th and 21st Vict., c. 35, for investing in a security, separate from that of the company, the reserve-fund of £29,104. 13s. 5d., has not hitherto been acted upon. This fund has therefore, as yet, no existence apart from the provisions of the Act and the company's own business operations. It is a mere cross account in the books, the balance on which from time to time shows the amount of unapplied revenue invested in extension of the works. When any demand is made on the part of revenue for a portion of this fund, it can only be met by a farther increase of the balance due to the banker. The Act 20th and 21st Vict., recites that the amount of profits expended on the undertaking then amounted to £29,104 13 5

The operations of the account subsequent to the passing of the Act are, therefore, effected in the following manner:—

Under the present inquiry, the accountant is ignorant of the position of the company's affairs prior to the 31st of May, 1857, but it is believed that, when the dividend for 1857 was made, the rest was debited with a deficiency of revenue necessary to make up the rate to 10 per cent., and in this way was lessened by 4,886 16 6

Leaving the balance on rest account, at 31st May, 1857 . . . . £24,217 14 11

During the three years under investigation, the following alterations have taken place:—

At 31st May, 1859, this sum of surplus revenue was added to the account	£1160	16	1
At 31st May, 1860, in like manner, there was added .	2561	10	10
	£3722	6	11
To supply the deficiency at 31st May, 1858, necessary to pay 10 per cent., this account was debited	1448	1	11
	2,274	5	0
Leaving the rest as at 31st May, 1860	£26,491	19	11

Having made these necessary explanations of the financial position of the company, so far as regulated by Act of Parliament, the accountant will now proceed to report on the details of the management for the years to which the investigation is limited; and, as it is an expressed wish in the remit that the details of the expenditure on capital and revenue accounts should be made full, the accountant will do so in such a manner as will enable these to be fully understood from the entries given, and thus render it unnecessary to encumber this report with many remarks on the several items in the branches. The following details, then, show the results of the company's operations for the years ending May 31, 1858, 1859, and 1860, respectively.

[The accounts for 1858 and 1859 are omitted, in consequence of their extreme length, and those for 1860 are alone given, to show the manner in which they are stated.]

CAPITAL ACCOUNT.

For the Year ending 1859-60.

The following sums form the basis of the partners capital:—

1. Amount of stock held by partners		£150,000 0 0	
2. Premiums on stock sold		49,724 16 0	
3. Suspense account		23,930 9 1	
Note.	£23,930 9 1		
Surplus revenue for this year	2,561 10 10		
	£26,491 19 11		
4. Amount due Union Bank and others on open credit.		19,215 14 8	
Note.	£19,210 19 4		
Unpaid interest on loan	4 15 4		
	£19,215 14 8		
5. Sum borrowed on mortgage		50,000 0 0	
6. Amount due sundry parties on open account		3,320 18 1	
7. Unclaimed dividends		160 1 7	
8. Net surplus revenue for year		16,999 0 10	
			£313,351 0 3

The sums which have been expended from time to time on the works may be classified as follows:—

1. General Establishment.			
For amount of outlay on works and plant at May 31, 1859		239,293 11 0	
Extensions during the year.			
On pipes and laying	£1,580 2 3		
On staircase fittings, &c.	2,326 2 5		
On works, Tradeston	3,525 11 4		
On Patrick Works	45 3 1		
		7,476 19 1	
		£236,770 10 1	
Less sum taken from revenue to cover the depreciation of works, &c.		1,500 0 0	
		£235,270 10 1	
2. Gas-Meters Lent Consumers.			
For amount expended on meters	£45,127 11 0		
Additional for new meters	£2,482 15 10		
Additional for pipes and connexions	1,097 0 6		
	3,579 16 4		
	£48,707 7 4		
Less sum carried to the debit of account kept for repairs of meters, to cover deterioration	£2,500 0 0		
Meters sold	2 6 4		
	2,502 6 4		
		46,205 1 0	
3. Sum Invested in New Three per Cent. Stock		5,000 0 0	
4. Estimate placed on Arrears of Rates Outstanding		14,000 0 0	
5. Property at Lancefield:—			
Value of feu to Lancefield Spinning Company	£ 600 0 0		
Value of ground unfeued	£1,243 0 3		
		1,843 0 3	
6. Stock of Materials and Miscellaneous Assets.			
Value of Coal on hand	£7,102 18 10		
,, Coke on hand	221 10 4		
,, Limestone on hand	90 0 0		
,, Firebricks	44 12 8		
,, Shovels and Riddles	28 16 0		
,, Pipes	1,197 13 6		
Sum outstanding for ammoniacal liquor	1,660 18 1		
Sum outstanding for tar	180 14 6		
Arrears for house rents	20 0 0		
Brick-making account	233 3 0		
Counting-house furniture	175 10 2		
Cash on hand	76 11 10		
		11,032 8 11	
			£313,351 0 3

REVENUE AND EXPENDITURE ACCOUNT.

Year 1859-60.

RECEIPTS FOR REVENUE.

1. *From Gas-Rates.*			
Amount of rates collected for the current year		£65,900 11 8	
Estimate put on outstanding arrears, the amount for this year being £18,220		14,000 0 0	
Amount recovered beyond estimate put on the previous year's arrears		421 12 8	
			£80,322 4 4
2. *From Products of Gas-Making and Miscellaneous Receipts.*			
Ammoniacal liquor		£2,887 12 3	
Coke		3,183 6 5	
Tar		373 4 5	
Waste lime		208 4 0	
Dividends from Government stock		155 9 4	
Rents from house property		366 15 6	
Ground annual for Lancefield Spinning Company		28 14 2	
Old metal		108 3 11	
Regi-ter of transfer fees		7 15 0	
		7,319 5 0	
			£87,641 9 4

DISBURSEMENTS FROM REVENUE.

1. *General Expenditure.*			
Coals, 45,753⁷ tons		£39,938 5 5	
Workmens wages		8,096 5 6	
Lime		1,233 18 3	
Firebricks and clay		712 2 11	
Salary to manager, accountant, cashier, and inspector		1,340 0 0	
Inspectors and sub-collectors wages		3,064 5 4	
Income-tax, poor-rates, police assessments		2,743 10 10	
Tallow and oil for engine		105 12 7	
Water		175 17 3	
Shovels, riddles, and barrows		258 19 4	
Carting account, keep of horses		423 10 6	
Feu duties, payable by the company		545 15 5	
Stationery, printing, &c.		313 11 11	
Office in Virginia Street		79 19 2	
Carried forward		£59,031 14 5	

Brought forward		£59,031 14 5	
Incidental charges		174 10 4	
Committee of management		321 9 0	
Law expenses		168 13 1	
Accidental charges, surgeon's fees, &c.		30 19 0	
Gas-burners given consumers		58 12 0	
Repairs on outlaying gasholders		49 2 6	
2. *Repairs on Works and Plant.*		59,835 0 4	
Kirk Street Works—			
Workmen's wages	468 15 8		
Ironmongery & castings	82 19 3		
Paints and oils	64 10 4		
Slater work	61 9 2		
Plumber work	4 1 10		
Gas-fittings	30 1 5		
Mason work	16 14 6		
Brass castings	5 0 6		
Gas apparatus	47 6 1		
Carting rubbish	25 5 3		
Common coal	33 8 11		
Naphtha	2 10 0		
Causewaying	14 11 0		
Sundries	25 3 6		
Tradeston Works—		881 17 5	
Workmens wages	164 14 4		
Ironmongery	50 13 5		
Gas-fittings	4 11 8		
Castings	84 17 3		
Paints and oils	10 15 2		
Stationery	3 18 0		
Causewaying	14 16 0		
Mason work	0 17 9		
Slater work	4 9 4		
Plumber work	7 4 0		
Plaster work	0 15 7		
Ropes	1 4 6		
Wood	3 0 0		
Coal	7 14 10		
Sundries	40 16 4		
		400 8 2	
Partick Works—			
Workmens wages	149 2 4		
Furnace mouthpiece	128 19 11		
Gas-fittings	1 6 5		
Causewaying	18 17 0		
Slater work	4 11 0		
Common coal	3 15 9		
Stationery	4 15 6		
Ironmongery	13 14 10		
Castings and plug-pipes	61 14 8		
Ropes	1 1 5		
Paints and oils	4 3 11		
Plumber work	6 1 7		
Repairing engine	5 4 6		
Repairing retorts	30 8 10		
Sundries	1 15 0		
		435 12 8	
Mains and Pipes—			
Sundries used in the repairs of pipes	84 14 11		
Workmens wages	290 4 7		
Pipes and connexions used for repairs, originally charged to pipes and laying, transferred to this account	463 3 0		
		838 2 6	
Gas-Meters—			
Workmens wages	591 6 1		
Chemicals	24 15 3		
Meter-dials	1 7 0		
Files	14 9 0		
Stationery	1 1 0		
Meter-gearing	37 5 3		
Ironmongery	75 10 11		
Paints and oils	9 10 5		
Tin plates, copper, &c.	41 19 7		
Sundries	3 6 6		
For this sum placed to the credit of gas-meters account, and carried to the debit of this account for deterioration	2500 0 0		
		3300 11 0	
		5,856 11 9	
3. Interest on mortgages and bank credit		3,450 16 5	
4. Sum set apart to cover depreciation on works		1,500 0 0	
Total expenditure			70,642 8 6
Net surplus revenue of the year			16,999 0 10
Applied thus:—			
1. In payment of a dividend of 10 per cent. under deduction of income-tax		14,437 10 0	
2. By carrying the balance to the credit of suspense account		2,561 10 10	
			16,999 0 10

The results of the operations of the foregoing revenue accounts show, as previously stated in this report, that for the three years under notice there was added to the rest account, after payment of the maximum statutory dividend, a sum of £2274. 5s.

It is also shown that the following items of extraordinary expenditure have been charged against revenue:—

I.—*In the year ending May* 31, 1858—			
1. Sum charged for depreciation in the value of the works and plant		£1500 0 0	
2. Sum (so far as the accountant has been able to trace it) expended on the building up of a coal-shed blown down in a gale		490 11 4	
			£1990 11 4
II.—*In the year ending May* 31, 1859—			
1. Sum charged against revenue for depreciation in the value of the work and plant		£1500 0 0	
2. Extraordinary repairs on works—			
1. Expense (so far as the accountant has been able to ascertain it) of rebuilding coal-house at Tradeston, blown down by storm	365 0 2		
2. Do. do. of retort-house at Partick	524 7 5		
3. Proportion of expenditure on new meters, transferred from capital account as a charge against revenue account	1000 0 0		
			£3389 7 7
Carried over			£5377 18 11

Brought over		£5377 18 11
III.—*In the year ending May* 31, 1860—		
1. Sum charged against revenue for depreciation in the value of the works and plant	£1500 0 0	
2. Proportion of sums expended on new meters, transferred from capital account as a charge against revenue account	2500 0 0	
	4000 0 0	
Amounting in all for 1858, 1859, and 1860, to		£9379 18 11

The sums entered above as "Extraordinary Repairs" are not kept separate in the company's books from the ordinary charges on revenue. The accountant, therefore, reports the sums thus stated with such accuracy, only, as he can do so from the sometimes meagre information contained in the vouchers of the expenditure, and from verbal explanations which he has received from the officers of the company.

The sum of £1500, which has been charged yearly against revenue for depreciation, is the sum which, in continuation of what he believes to have been the practice of the company, has been written off the general establishment account for deterioration in the value of the works and plant; but the sums entered against revenue as extraordinary repairs on works, and as expended on replacing meters, &c., may also be looked on, practically, as farther charges on account of deterioration. It thus appears that, for the three years ending May 31, 1860, the company have charged against revenue, on account of deterioration, the sum of £9379. 18s. 11d., or an average of £3126. 12s. 11d for each of the years under investigation.

In examining the revenue account, it will be seen that, with the exception of the points already adverted to, there is little to remark upon, save the important question of the manufacture and consumption of gas. A special inquiry has been instituted into the mode in which gas has been made and disposed of—on this head, the accountant has been furnished with returns, the results of which will now be briefly stated:—

I. *For the year ending May* 31, 1858, *it appears*—		
The quantity of gas manufactured during this year was, by station-meters, and stated in cubic feet		457,325,000
Of this quantity, the estimated consumption was:—		
1. Under assessment by service-meters	283,931,000	
2. „ by contract	58,993,182	
	342,924,182	
3. The estimated consumption, as returned to the reporter, for the use of the works at the several stations, and for the offices and houses of the officers and servants of the company	7,883,760	
		350,807,942
Leaving for condensation, leakage, and consumption of gas, beyond supply contracted to be given to consumers		106,517,058
II.—*For the year ending May* 31, 1859—		
The quantity of gas manufactured during this year was, by station-meters, and stated in cubic feet		438,531,000
Of this quantity, the estimated consumption was:—		
1. Under assessment by service-meters	304,838,000	
2. „ by contract	29,918,045	
	334,756,045	
3. The estimated consumption, as returned to the reporter, for the use of the works at the several stations, and for the offices and houses of the officers and servants of the company	7,883,760	
		342,639,805
Leaving for condensation, leakage, and consumption of gas beyond supply contracted to be given to consumers		95,891,195
III.—*For the year ending May* 31, 1860—		
The quantity of gas manufactured during this year was, by station-meters, and stated in cubic feet		470,457,000
Of this quantity, the estimated consumption was:—		
1. Under assessment by service-meters	325,068,000	
2. „ by contract	28,218,702	
	353,286,702	
3. The estimated consumption, as returned to the reporter, for the use of the works at the several stations, and for the offices and houses of the officers and servants of the company	8,047,860	
		361,334,562
Leaving for condensation, leakage, and consumption of gas beyond supply contracted to be given to consumers		109,122,438

The loss thus attributed to condensation, leakage, and consumption of gas beyond supply contracted to be given, was at:—

1. May 31, 1858, 23·29 per cent.
2. May 31, 1859, 21·86 „
3. May 31, 1860, 23·19 „

} of the quantity manufactured for these several years.

The return in which these details are given, has been prepared expressly for the information of the reporter.

It is confessedly only an approximation to the truth, and it is, therefore, doubtful how far its perfect accuracy can be relied upon. The consumption at the stations seems very large. The chief portion of it arises from the profuse use of gas at the retort-houses, and about a third part is consumed in what are termed the "Tunnels" at the works in Tradeston. The works alluded to are sunk beneath the level of the adjoining ground; and labour is there carried on without the benefit of natural light.

The company are now doing away with this anomaly in economical production, and are fitting up new retort-houses of modern construction and capabilities. These alterations necessarily imply additional outlay on capital account, but there may thus be effected an annual saving of nearly two millions of cubic feet in the consumption of gas now taking place in the Tunnels.

The quantity stated in this return, as consumed by contract in dwelling-houses, and without the use of the ordinary check by meter, is assumed, on a calculation made by the company, that the consumption of a single light for a year ought to be about 2700 cubic feet.

It is, however, explained by the manager in a memorandum appended to the return, that—

A large proportion of the gas lost to the company arises from the use of No. 2 swallow-tail and other large burners, in place of the single jet allowed in dwelling-houses, and on stairs supplied by contract, and also from burning all night, in place of from dark till 11 or 12 o'clock.

The manager then says:—

Assuming that about five thousand swallow-tails are so used in place of single jets, then the extra or improper consumption of gas would amount to about forty-five millions of cubic feet annually, and would reduce the apparent loss from condensation from 23·19 per cent. (the loss in 1860), to 13·8 per cent.

It will be observed that the manager places the number of improper burners hypothetically.

The burners are stated to be chiefly in use among very small consumers, who number upwads of seven thousand, and whom it is difficult for the company to detect, and as difficult to convict when found out. The manager also reports that, should parties improperly using swallow-tails "be assumed at only two thousand five hundred, then the per centage of loss would be reduced to 18·71 per cent."

The reporter has had no means of verifying the statement made as to the amount of consumption. The results supplied to him are mere approximations, and do not appear to be founded on data, the accuracy of which is ascertainable from the company's books.

The condensation and leakage are increased beyond the average rate by the great extent of pipeage of the company; and when this improper consumption is added, both seriously affect the question of the price of gas. It may be for the consideration of the company whether every consumer, however small, ought not to be supplied with a meter, so as to check, or at least to reduce, the loss annually accruing to the company under this head. It is right, however, for the reporter to add, that to supply every consumer with a meter, would cost upwards of £10,000, and that at present the company make no charge for those in use, which seem to need frequent renewal and repair.

Another element of much importance in estimating the price of gas, is the cost of coal. The price and consumption of this article, in the years under consideration, have been as follows:—

I.—*In the year ending May* 31, 1858—	
45,854 13 tons have been used, costing, on an average, 19/4¾ per ton, or	£44,468 0 9
The cost of coal for 1000 cubic feet of the quantity of gas manufactured thus being	1/11·336
And for 1000 cubic feet of the quantity sold	2/7·121
II.—*In the year ending May* 31, 1859—	
41,735 15 tons have been used, costing, on an average, 18/7¾ per ton, or	£39,910 1 2
The cost of coal per 1000 cubic feet of the quantity of gas manufactured thus being	1/9·294
And for 1000 cubic feet of the quantity sold	2/3·895
III.—*In the year ending May* 31, 1860—	
45,753 8 tons have been used, costing, on an average, 17/5½ per ton, or	£39,938 5 5
The cost of coal per 1000 cubic feet of the quantity of gas manufactured thus being	1/8·370
And for 1000 cubic feet of the quantity sold	2/3·132

The selling price of gas consumed by meter during the three years was 5s. per 1000 cubic feet, but the company have allowed discount as follows:—

To all consumers whose accounts were above £4, and less than £20			5 per cent.	
„	„	£20	„ £100	10 „
„	„	£100		15 „

The accountant is unable to report the total amount allowed to consumers under this head, as the books of the company have not been framed with a view to exhibit the specific amount of discounts given during the year. The officers of the company have, however, informed the accountant that the average discounts may be estimated at 4 per cent. on the gross revenue from gas sold by meter, thus practically reducing the price of gas sold in this manner to 4s. 9½d. per 1000 cubic feet.

The accountant has made a series of calculations, showing the cost of manufacturing the gas, and the price actually received from the public in the sale of it. The following statements give the results of these for the three years under investigation:—

I.—*In the year ending May* 31, 1858—

			Per 1000 Cubic Feet of 342,924,182, the Amount Sold.
1. Sums realized for gas sold during the year, and estimate put upon arrears at May 31, 1858, was	£75,902 19 4	or	4/5·122
2. Sums recovered from previous year's rates	2,076 11 10	„	0/1·453
3. Products of gas-making, and miscellaneous receipts	6,738 5 2	„	0/4·716
	£84,717 16 4	„	4/11·291
And that the cost of manufacture was as follows:—			
1. General expenditure	£63,541 10 2	or	3/8·470
2. Repairs on works and plant, &c.	3,579 13 10	„	0/2·505
	£67,121 4 0	„	3/10·975
Add interest on loans and bank account	2,857 4 3	„	0/2
And sum written off for depreciation	1,500 0 0	„	0/1·050
	£71,478 8 3	„	4/2·025 4/2·025
It thus appears that the surplus profit, at the rate of 1000 cubic feet was			0/9·266

II.—*In the year ending May* 31, 1859—

			Per 1000 Cubic Feet of 334,756,045, the Amount Sold.
Sums realized—			
1. Gas sold during year, &c., and estimate put upon arrears	£76,893 17 5	or	4/7·128
2. Sum recovered from previous year's rates	273 7 9	„	·196
3. Products of gas-making, and miscellaneous receipts	7,638 3 7	„	0/5·476
	£84,805 8 9	„	5/0·800
Cost of Manufacture—			
1. General expenditure	£58,386 4 1	or	3/5·859
2. Repairs on works, plant, &c.	5,569 13 8	„	0/3·993
	£63,955 17 9	„	3/9·852
Add interest on loans and bank interest	3,188 14 11	„	0/2·286
And sum written off for depreciation	1,500 0 0	„	0/1·076
	£68,644 12 8	„	4/1·214 4/1·214
Divisible profit on 1000 cubic feet of gas			0/11·586

III.—*In the year ending May* 31, 1860—

						Per 1000 Cubic Feet of 353,286,702, the Amount Sold.
Sums Realized—						
1. Gas sold during year, and estimate put upon arrears	£79,900	11	8	or	4/6·279	
2. Sums recovered from previous year's rates	451	12	8	,,	·287	
3. Products of gas-making, and miscellaneous receipts	7,319	5	0	,,	4·972	
	£87,641	9	4	,,	4/11·538	
Cost of Manufacture—						
1. General expenditure . .	£59,835	0	4	or	3/4·648	
2. Repairs on works, plant, &c.	5,856	11	9	,,	0/3·979	
	£65,691	12	1	,,	3/8·627	
Add interest on loans and bank interest	3,450	16	5	,,	0/2·344	
And sum written off for depreciation	1,500	0	0	,,	0/1·019	
	£70,642	8	6	,,	3/11·990	3/11·990
Divisible profit on 1000 cubic feet of gas . . .						0/11·548

The available profit on 1000 cubic feet of gas shown in the returns for the above years, formed the source whence the surplus revenue and dividend were obtained.

The reporter has now laid before the committee the information required by the remit as to capital, revenue, and expenditure, dividends to shareholders, and rest or contingent-fund, with details of the expenditure in the branches indicated by the committee. He believes that the statements contained in this report fairly represent the actual dealings of the company with the funds under their control, and that the returns, as to the manufacture and consumption of gas (though in part founded on estimates), are to be relied on sufficiently for the purposes of investigation. The committee will, he trusts, from the information submitted, be enabled to judge "whether the disposal of the funds of the company has been in accordance with the various Acts of Parliament, so far as the public are interested."

In conclusion, the reporter begs to state that he has, during the whole course of the investigation, received from the directors and officials every information and assistance required by him regarding the affairs and books of the company, and that these gentlemen have throughout shown a desire to meet all the requirements of the committee.—All which is respectfully reported by

Glasgow, December 5, 1860. JAMES M'CLELLAND, C.A.

ON THE MANUFACTURE OF OXYGEN AND HYDROGEN.

By MM. SAINTE-CLAIRE DEVILLE and H. DEBRAY.

[Abridged from the *Annales de Chimie et de Physique**]

Oxygen.

The manufacture of oxygen has required long consideration on our part to arrive, as we believe we have arrived, at producing it at a moderate price, in simple apparatus, and in a continuous manner. We have had successively to study all the known modes of extraction, because each of them seemed to us still capable of being improved upon, and because it might happen that the process selected might be beneficially varied according to the facilities met with in different localities in procuring the raw material, and also with their prices.

We commence naturally by the study of manganese as a source of oxygen, because it is the substance which we necessarily had first recourse to. We shall afterwards examine the production of gas from different salts; and, lastly, from sulphuric acid.

Manganese.—We have used very many varieties of manganese of different origins and of different prices. We shall now give the results we have attained, describing successively our process and apparatus for producing oxygen on a large scale, and shall conclude by giving an estimate of the cost prices of this valuable gas.

Mode of Trial.—Take a mercury bottle capable of containing 4 or 5 kilogrammes of manganese in powder and fragments, enlarge the screwed aperture in its upper surface, and fit in a length of wrought iron-tubing, bent at right angles at about a quarter of its length, and filed at the short end of the bent pipe, so as to present a slightly conical surface. This extremity must be forced into the opening of the bottle, which we suppose to have been previously filled with weighed manganese, and made tight by a luting composed of fire-clay and cow-dung. The chlorometric value of the manganese should be taken beforehand, so as to have some approximative information as to the quantity of oxygen it contains.

Place the mercury bottle in a furnace full of burning coke, the temperature of which is to be maintained at a bright red heat. The oxygen disengaged is caused to pass through a vessel provided with a safety-pipe, and afterwards through a solution of potash. The first vessel retains the acid water given off by the manganese; the potash retains the carbonic acid. The purified gas is received into a graduated gasholder, and is measured on its way there by an accurately adjusted meter.

The following are the results obtained:—

Origins.	Degrees of Chlorometric Value.	Litres of Oxygen from One Kilogramme of Manganese.†
Romanéche	55 to 60	34·3
Spanish	61 to 63	40·0
Pyrénées	70	41·1
Giessen	75	50·1
Piedmontese	90	60·0

The last three specimens of manganese were furnished to us by Messrs. Mangin, of Paris, and were chosen from amongst the non-calcareous varieties, which is an important consideration in the manufacture of oxygen.

No. 1, obtained at Romanéche, in the Morvan, is well known. It is ferruginous, and accompanied with quartz and fluate of lime. Its cost is 10 francs the 100 kilogrammes. It was supplied to us by M. Merle, of Allais, who purchases it at this price.

No. 2—Spanish—costing 16 francs the 100 kilogrammes at Paris, must be of small value at the mine. We are not aware of the precise locality from which it is obtained. It would be very advantageous, if it could be had in large quantities; but we have not been able to procure sufficient information in this respect.

No. 3—Pyrénées—is a very fine specimen, containing many kidney-shaped pieces of great purity, and very well crystallized. The black and compact pieces, treated with acid, leave an abundant residue, composed of sand and argillaceous matter. This manganese is procured at Bagnères de Luchon and its environs, and is worth 18 francs the 100 kilogrammes at Paris. It is the description we have used in the greater number of our experiments.

No. 4—the manganese of Giessen—which is that used in all our laboratories for the production of chlorine. It was sold to us in Paris at 27 francs the 100 kilogrammes.

No. 5—Piedmontese. This manganese, which is obtained at Traverselle, is of great purity, and much sought for by glass manufacturers. Its value at Paris is 40 francs the 100 kilogrammes.

The oxygen collected under these circumstances is far from being pure. Even when all necessary precautions have been taken to expel the air from the vessels, a considerable proportion of nitrogen is still found in the collected gases. We have analyzed them, in seeking for carbonic acid, by potash, and in estimating the oxygen by the reagent of M. Liebig—the alkaline pyrogallate of potash, which is very suitable for this purpose. The nitrogen remains, and its negative properties may be proved; so that no possible doubt can remain as to its nature.

The following are the results of our analyses:—

	No. 1. Romanéche.	No. 2. Spanish.	No. 3. Pyrénées.	No. 4. Giessen.	No. 5. Piedmontese.
Oxygen	94·6	93·7	94·5	94·0	96·4
Nitrogen	5·4	6·3	5·5	6·0	3·6
	100·0	100·0	100·0	100·0	100·0

Since the days of Scheele, it is well known that oxygen obtained from manganese contains nitrogen, and that this gas is given off at the commencement of the preparation. Berzelius had even observed that the gas from manganese possessed a slightly nitrous smell. This smell, which we have often observed, we ourselves attributed to the presence of ozone; but as the gas collected at every stage in the manufacture of oxygen always contained nitrogen, we were induced to seek in the manganese itself the permanent matter which furnished a gas whose presence was very inconvenient in our metallurgic operations.

All the manganese that we have examined up to the present time contained considerable quantities of water. Sixty kilogrammes of the Giessen manganese gave 5 kilogrammes of water, of which the reaction was sensibly acidulous. If this water is evaporated, after having been exactly saturated with pure potash, 15 grammes of nitrate of potash and about 5 grammes of the chloride of potassium are obtained. The absence of nitratis in the crystallized salts makes us think that chlorine and hyponitric acid are the two gaseous products which are condensed.

It appears then to be very probable that manganese may contain nitric acid, unless the ammonia (undergoing by contact with oxygen and manganese a total combustion analagous to that which is produced in the celebrated experiment of M. Kuhlman), be not the source of the nitric acid condensed. We have washed with weak sulphuric acid 250 grammes of manganese finely powdered, and have only found in the solution 4 millegrammes of ammonia, which the 2 litres of distilled water employed may very readily have contained.

In boiling 500 grammes of powdered Giessen manganese with one or two litres of water and 10 grammes of carbonate of potash, and then treating the filtered liquor by acetic acid very slightly in excess, and evaporating to dryness, there is obtained a saline residue, which, washed with boiling alcohol of 80°, gives up its nitrate, which crystallizes in cooling.

Finally, in digesting 500 grammes of this manganese with pure water, and evaporating the filtered solution, there is obtained a saline deposit, which has the following composition:—

	Millegrammes.
Sulphate of lime	103
Chloride of calcium	205
Chloride of magnesium	84
Chloride of sodium	174
Nitrate of soda	353
Nitrate of potash	629
	1548

Each kilogramme of this manganese gives up, therefore, to water 3·096 grammes of soluble substances entirely neutral. We are warned of the presence of nitrates in these substances by a circumstance which it is of importance to observe in the analysis. When it is desired to expel by heat, the acetate and oxalate of ammonia which have been introduced during the operation, there is manifested in the last moments of the process a vivid combustion and a deflagration sufficiently strong to cause loss, which cannot always be avoided even if the vessel is covered with a funnel.

It is difficult to explain the natural formation of binoxide of manganese, which is never produced by direct oxidation, and which we can only obtain in our laboratories by the decomposition of manganic acid or of nitrate of manganese. Our analyses would rather induce us to believe that the manganese is derived from the nitrate for the neutral or acid nitrate of manganese dissolved in water, and heated in closed vessels to about 150°, leaves a shining deposit of black binoxide, having its surface covered with rounded protuberances like certain of the natural manganeses, but in no degree crystallized. This experiment which M. de Senarmont has made, and which we have repeated, having rendered the presence of nitric acid in natural manganese probable, warrants the opinion that we have just developed.

But M. de Boussingault, who has analyzed a great number of samples of manganese, and who has constantly found nitric acid present, attributes the presence of this acid to the filtration of fluvial waters charged with organic matters into the earth in which the beds of manganese are found. This explanation is rendered very probable in most of the cases that he has examined, by its being shown that nitric acid is really found in all the substances that have been in contact with rain-water.

There is, besides, another consideration which tends to render this question unsettled. According to the analysis No. 4 of the gases obtained in the decomposition of Giessen manganese, supposing, which is scarcely probable, that we had completely expelled the air from our apparatus before analyzing the gas, according to the proportion of oxygen that we extracted from this manganese, it should have contained 3·6 per cent. of nitrogen; while the direct analysis previously alluded to proves only the presence of 1/1000th part of nitric acid. It must be admitted that nitrogen is there found in a particular state still unknown, and that further experiments are necessary for its search. We willingly admit that our own results, although sufficient for the purposes for which we publish them to-day, do not dispense with those minute researches which we propose to undertake for the purpose of elucidating this interesting question.

In a practical point of view, this impurity of manganese has really no inconvenience, and the following experiment proves it:—We mixed oxygen

* This paper forms the last chapter of an elaborate and interesting article on "The Metallurgy of Platinum, and its accompanying Metals."

† 1 kilogramme = 2·205 avoirdupois.
100 litres = 3·5316 cubic feet.

with about one quarter its volume of atmospheric air, and with this mixture, which contained 82·7 per cent. of oxygen, and 17·3 per cent. nitrogen, we melted 10 kilogrammes of platinum with 1200 litres of the mixed gases. This single operation could not have succeeded much better had the oxygen employed been entirely pure.

In ascertaining the combustion-supporting power of oxygen at the moment when it began to be given off in our apparatus, we several times experienced a violent explosion. We can only explain this explosion by the accidental or fraudulent presence of organic matter mixed with the manganese. It will, therefore, always be prudent to assay the gas by means of a small *eprouvette*, when it is desired to prepare oxygen from a manganese upon which no experiments have been made.

[The writers then proceed to give a description of the apparatus employed by them, which would not be intelligible to our readers without the numerous illustrations attached to the article.]

Our cast-iron bottles were constantly used for more than six months. We had four of them. One, which had a defect, broke after being heated two or three times. Of the three others, two are still in a serviceable state, one only having been destroyed by fire during the last day of our operations. In breaking it, we observed that the cast iron was transformed upon one portion of its thickness, both internally and externally, into a very compact magnetic oxide, impervious to gas, and offering a very great resistance. The centre part was unchanged. The portion which had given way corresponded accurately to an opening resulting from an imperfection in the casting, which had been plugged up by an iron rivet, of which the heads were beaten upon the casting.

We believe that cast-iron bottles, properly made and well proved, will last for more than twelve months in constant service. For this reason, we think that the price of these bottles will not form any very considerable portion in the cost price of oxygen manufactured from manganese. Each of these bottles weighs 26 kilogrammes, and costs 36 francs the 100 kilogrammes.

When these bottles are used for the first time, the carbon adhering to the surface of the iron produces a considerable quantity of carbonic acid, and the yield of oxygen is thereby diminished. As a proof of this, we may state that before our washer was finished, the gas traversed a vessel of the capacity of five litres, full of fragments of potash. In absorbing the carbonic acid, the temperature of this vessel increased more than 100°, and the gas was not so completely deprived of its carbonic acid as it would have been by our washer. 66 kilogrammes of Giessen manganese produced 2250 litres of oxygen, the composition of which was—

Nitrogen and oxygen	96·6
Carbonic acid	3·4
	100·0

The gas was measured by a meter between the washer and the gasholder.

In other operations, we obtained better results, as will be seen by the produce that we now report. We also carefully measured the coal used as fuel, in order subsequently to ascertain the cost price of the gas.

Giessen manganese		66	kilogrammes.
Oxygen produced	3024 litres		
Oxygen remaining in the two last bottles, collected on the following day	386 „	3410	litres.
Coal consumed for the first 500 litres	68 kilogrammes		
Coal consumed for the last 2524 litres	52 „	120	kilogrammes.
Maximum yield per hour		800	litres.
Oxygen produced per kilogramme		51·7	„
Coal consumed per cubic mètre by the first portion of the gas		136	kilogrammes.
Coal consumed per cubic mètre for the last portion of the gas		20·6	„
Average consumption of coal per cubic mètre		25·2	„

The consumption of coal remained the same in all our subsequent experiments.

The residual product of the manufacture of oxygen was sold to a chemical product manufacturer at the rate of 10 francs the 100 kilogrammes. It was intended for the use of glass manufacturers, who prefer it to crude manganese because it had lost 12 per cent. of its water and oxygen, which are either of no value or exercise a prejudicial influence in the preparation of glass.

The operation by itself is only sufficient to employ a workman when the furnace requires to be charged, without his being required to attend to any other part of the apparatus; so that we estimate that, with apparatus on a sufficiently large scale, one workman will easily manufacture 10 cubic mètres of oxygen in a day.

With these elements before us, we are able to calculate the cost price of the oxygen extracted from Giessen manganese on the following basis:—

66 kilogrammes of manganese, at 27 francs the 100 kilogrammes at Paris	17 fr.	82 c.
Labour	1	19
Fuel	2	72
Wear and tear of apparatus, &c.	0	50
Total	22 fr.	23 c.
Deduct the value of 58 kilogrammes of red manganese, at 10 francs per 100 kilogrammes	5	80
Cost of 3410 litres of oxygen	16 fr.	43 c.
Or, per cubic mètre	4	87

The cost from the other descriptions of manganese would be as follows:—

	Cost of Manganese per 100 Kilogrammes.	Cost per Cubic Mètre of Oxygen.
Romanéche	10 fr.	4 fr. 86 c.
Spanish	16	3 45
Pyrénées	18	3 86
Giessen	27	4 87
Piedmontese	40	5 98

For these calculations, the following data have been taken, supported as they are by the experiments previously narrated:

Coal necessary for the decomposition of 100 kilogrammes of manganese	206 kilogrammes.
Labour per 100 kilogrammes of manganese	1 fr. 81 c.
Wear and tear of apparatus per 100 kilogrammes	0 fr. 75 c.

Chlorate of Potash.—Chlorate of potash yields 271 litres of oxygen per kilogramme. One of its inconveniences consists in the difficulty of its manipulation. By mixing it, however, before decomposing it, with once or twice its weight of manganese (which serves for an indefinite period, provided that it is washed after it has been used, which washing, besides, is indispensable for the recovery of the chloride of potassium, the value of which must not be neglected in calculating the cost of the oxygen), its decomposition may be effected with regularity, while all danger is avoided.

We have ascertained that chlorate of potash can yield at a low temperature the quantity of oxygen that it theoretically contains, and that the value of the chloride of potassium may almost cover the expense of manufacturing the gas and washing, and evaporating, the chloride of potassium. In spite of this, however, the cubic mètre of oxygen, prepared with this salt, costs nearly 10 francs. As chloride of potassium can only be transformed into chlorate of potash by means of chloride of lime, itself prepared by manganese, there is no hope that the oxygen prepared by this method can be preferred to the gas which is obtained directly from manganese; nevertheless, in consequence of the facility with which this preparation is made, we thought it necessary briefly to mention the result of our trials.

Chloride of Lime.—Chloride of lime, heated to a dull red, gives 40 or 50 litres of oxygen per kilogramme, mixed with a little chlorine, of which it may be deprived, either by adding a little slacked lime to the chloride, so as to render it strongly alkaline, or by washing the gas in an alkaline water. The first method would be the most economical, and would, besides, allow iron vessels to be used. Care must be taken to avoid a heat that would fuse the chloride of calcium which remains, a circumstance less likely to occur with a mixture of slacked lime and chloride of lime.

The cost price of this oxygen, not including the expenses of extraction, which are inconsiderable, would be, at least, four and a half times greater than the price of a kilogramme of chlorine, or about 3 francs 60 cents. The cubic mètre of gas would, therefore, cost about 5 francs. This mode of preparing oxygen from chloride of lime is very regular, and withal is not dangerous. We particularly recommend this process to chemists. The calcination of the chloride of lime may be effected in glass vessels. Before introducing it into the retort, it should be mixed with a little slacked lime, and the gas, before being collected, should be slightly washed in an alkaline lye.

(To be continued.)

AN ACCOUNT OF GUY'S HOSPITAL WELL.

By William Odling, Esq., M.B., F.R.S.

[From the *Chemical News.*]

In 1858, it was determined to sink a deep well at Guy's Hospital, which should yield a quantity of excellent water, sufficient to supply the entire wants of the institution. The well, with its appurtenances, was planned and constructed by Mr. R. W. Mylne, C.E., F.R.S. It was commenced in the winter of 1858, and completed in the summer of the following year. Its total depth from the surface of the yard is 297½ feet; its depth down to the chalk, 197 feet; and, consequently, its depth into the chalk, 100½ feet. The level of the yard is two feet above Trinity high-water mark. The following table gives an enumeration of the principal strata gone through, with their respective thicknesses, in feet:—

	Feet.
Made ground	12
Peat	2
Gravel	24
London clay	63
Red and yellow mottled clay	24
Blue shelly clay	7
Red mottled clay	10
Sand and clay, with pebbles	15
Grey sand	44
Chalk	100½
	297½

The water supplied by the well is bright and colourless to the eye, brisk and pleasant to the taste, and has a marked alkaline reaction to test-paper. Its temperature, when fresh from the well, was found to be 54°, that of the atmosphere being 65·5° F. When boiled, the water becomes slightly turbid, from the deposition of the carbonates of lime and magnesia, which the excess of carbonic acid, driven off by ebullition, formerly held in solution. When boiled down to half its bulk, the clear water filtered from the deposit does not afford any evidence of the presence of either lime or magnesia. It has still, however, a strong alkaline reaction, from the carbonate of soda which it contains. This filtered water, when slowly evaporated, yields a white, saline residue, in which crystals of chloride of sodium and sulphate and carbonate of soda may be readily distinguished by microscopic examination. The residue left by the evaporation of the water to dryness undergoes, when heated to redness, a slight charring, from the presence of a small proportion of organic matter, but does not evolve any ammoniacal vapour recognizable by delicate test-paper. In addition to the constituents already mentioned, the water was found to contain some potash-salt, minute quantities of phosphoric acid, iron, and alumina, and a scarcely-perceptible trace of nitric acid, but no ammonia. The specific gravity of the water at 60° F. is 1000·77. Its total solid contents amount to 51·69 grains per gallon. This residue is composed of the following constituents, in the quantities indicated:—

Separate Constituents.	Grs. per Gal.
Chlorine	9·75
Sulphuric acid	9·24
Carbonic acid	6·90
Silicic acid	0·79
Lime	1·47
Magnesia	1·15
Soda	13·87
Sodium	6·32
Potash	0·66
Phosphate of iron and alumina	0·05
Organic matter	0·94
Total by summation	51·14
Total by direct experiment	51·69

A sufficient amount of sodium to combine with the whole of the chlorine was calculated as sodium, the remainder as soda. The phosphate of iron and alumina was determined as follows:—A portion of the water was evaporated to dryness, and the residue, after ignition at a low red heat to destroy the organic matter, treated with an excess of hydrochloric acid. This was expelled by evaporation, and the dried residue heated to about 250°, to separate the silica. The resulting mass was then treated with strong hydrochloric acid, and dissolved in hot water. A few drops of nitro-muriatic acid were next added, to oxidize the iron, after which the solution was filtered. The filtrate was precipitated with a slight excess of ammonia, and the whole gently heated. After standing for a night, the pale ochrey precipitate was collected on a filter, washed, dissolved in hydrochloric acid, reprecipitated by ammonia, collected on a filter, washed, dried, ignited, and weighed. The ignited mass was then treated with a little carbonate of soda, to render it soluble, and dissolved in hydrochloric acid. Phosphoric acid, alumina, and sesquioxide of iron, were detected in the resulting solution. There was more than sufficient iron and alumina present to carry down the whole of the phosphoric acid. The organic matter was estimated by evaporating a portion of the water to dryness at 250°, then igniting the residue for some time at a low red heat, moistening it with water, treating the moist mass with carbonic acid for several hours, and then again drying at 250°. After this restoration of the carbonic acid, driven off from the lime and magnesia, the loss on ignition was considered to be organic matter. This method of determination, introduced by Dr. Clark, though not rigidly accurate, is, I believe, the best at present known. The other estimations were made in the usual manner, and do not call for any remark.

In the evaporated residue, the acid and basic constituents of the water seem to be combined with one another, somewhat in the manner indicated below:—

Combined Constituents.	Grs. per Gal.
Chloride of sodium	16·05
Carbonate of soda	12·36
Sulphate of soda	15·21
Sulphate of potash	1·33
Carbonate of lime	2·62
Carbonate of magnesia	2·37
Silica	0·79
Phosphate of iron and alumina	0·05
Organic matter	0·94
Total residue	51·72

It is observable, however, that the mode in which the different constituents are combined in the residue affords no information as to the mode in which they are combined in the water itself. It appears probable, indeed, that, in the water, every acid is united with every base, so as to form the greatest possible number of salts, the amount of each different salt formed being dependent conjointly upon the relative masses and affinities of its constituents. Even the arrangement of the different constituents of the residue, to form definite salts, is, to some extent, a conventional affair. Thus, in the above statement of results, the silica is placed apart, in accordance with ordinary custom. It was ascertained, however, that in the dried residue of the water, and still more in the considerably evaporated water, a portion of the silica existed in the state of silicate of soda, and, doubtless, the silica in the natural water was also present in that form. The magnesia, again, is set down as a monocarbinate; whereas, neither in the water nor the residue does it really exist in that state, but in the former as bicarbonate, and in the latter as three-fourths carbonate. The water is but sparingly aërated. The total quantity of carbonic acid in a gallon was found to be, as a mean of two concordant determinations, 13·98 grains. Deducting the 6·90 grains of fixed carbonic acid, we have an excess of 7·08 grains, or just sufficient to convert the neutral carbonates into the state of bicarbonates, so that practically the water contains no free carbonic acid. There were also present in a gallon of the water 5·49 cubic inches of nitrogen, and 0·91 cubic inches of oxygen gas, measured at mean temperature and pressure. The low ratio of the oxygen to the nitrogen is probably due to a portion of the originally-dissolved oxygen having been expended in oxidation, during the percolation of the water through the earth. The water of which the above-described analysis was made was taken from the well on May 16, 1860. Another sample was taken on July 23, 1860. The total residue in this second sample was found to be, as a mean of two experiments, 50·84 grains*, including 0·7 grain of combustible matter. In the interval between the taking of the samples there had been more than 7½ inches of rainfall, which may possibly have had to do with the slight diminution in the amount of solid contents yielded by the water.

In the following table, the analytical results, obtained with Guy's Hospital water, are compared with those obtained with some other deep-well waters in London, to which allusion is about to be made:—

Constituents.	I.	II.	III.	IV.	V.	VI.
Chloride of sodium	16·05	12·7	19·04	10·53	13·92	14·30
Carbonate of soda	12·36	11·6	11·37	8·63	10·92	6·73
Sulphate of soda	15·21	24·25	20·27	13·14	10·75	15·69
Sulphate of potash	1·33	—	1·33	—	2·10	1·92
Carbonate of lime	2·62	6·18	2·74	3·50	4·14	5·39
Carbonate of magnesia	2·37	1·08	2·07	1·50	2·98	3·20
Silica	0·79	0·44	0·40	0·50	0·70	0·60
Phosphate of iron and alumina	0·05	0·43	0·97	traces	traces	traces
Organic matter	0·94	—	0·66			
Total grains per gallon	51·72	56·80	58·85	57·80	45·41	47·83

No. I. is my analysis of Guy's Hospital water.

No. II. is Mr. Graham's analysis of the water from Messrs. Combe and Delafield's well in Long Acre. In his analysis, the phosphoric acid was considered to be in combination with both iron and lime; so that the 0·43 grain, in the table, should be set down to phosphate of iron and lime, instead of to phosphate of iron and alumina.

No. III. is Mr. Dugald Campbell's analysis of the water of the Orange Street well, from which the fountains in Trafalgar Square are supplied. I have made a trifling alteration in the arrangement of his results, so as to make them comparable with my own.

No. IV. is Mr. Brande's analysis of the water of the Mint.

No. V. is my analysis of the chalk spring water; and

No. VI. my analysis of the sand spring water, from a deep well at Mr. Burnett's distillery, in Vauxhall.

Some of the constituents of these waters are highly interesting in a scientific point of view. The presence of potash in deep-well water was first ascertained in the case of the artesian water of Grenelle, near Paris which, moreover, is quite free from soda salts. The fixed constituents in a gallon of this water, as estimated by M. Payen,* are shown below:

Constituents.	Grains per Gal.
Chloride of potassium	0·763
Bicarbonate of potash	2·072
Sulphate of potash	0·860
Carbonate of lime	4·760
Carbonate of magnesia	0·994
Silica	0·399
Organic matter	0·015
Total residue	9·863

Mr. Graham was unable to detect potash in Messrs. Combe and Delafield's well, nor could Mr. Brande recognize its presence in the water of the Mint. It has, however, been found in the Trafalgar Square water, by Messrs. Abel and Rowney, by Mr. D. Campbell, and by Dr. Dupré and myself. Moreover, potash has been detected by several chemists in various other deep-well waters of the London basin; there was no difficulty in recognizing its existence in the Guy's Hospital water. I am quite unable to account for the irregularity of its presence in waters derived from the same strata, and at situations comparatively near to one another. It does not appear to depend upon the different depths of the borings.

The presence of phosphoric acid in deep-well water was first ascertained by Mr. Graham in his examination of the waters of Messrs. Combe and Delafield's well in 1845. This acid has since been invariably found, when sought for, in the deep waters of London. Its presence is not surprising, for phosphoric acid is a compound of which minute quantities are very widely distributed in nature. It exists in the deep-well waters in variable, but always in very small, proportions. The amount of phosphoric acid which I found in Guy's Hospital water is considerably less than that which other chemists have found in the waters of other deep wells. The estimation, however, was made very carefully, and corroborated in several ways. When nitrate of silver is added to an aqueous solution of the fused residue of an evaporated deep-well water, an abundant precipitate is produced, the yellow colour of which is at times very decided. This yellow colour has been considered to result from the phosphoric acid existing in the water. In my opinion, the quantity of phosphoric acid present is, in no case, anything like sufficient to account for the coloration, which, I believe, is really dependent upon the carbonate of soda. In adding nitrate of silver solution to the solution of an alkaline carbonate, whenever the drop of nitrate of silver is temporarily in excess, we always obtain a yellow precipitate, as is, indeed, well known. Phosphoric acid is also found in the water of shallow wells, or land-springs of the London gravel; but, in this case, it is, doubtless, derived from contamination of the water with products of animal decomposition, and is associated with obvious quantities of other compounds of similar origin—ammonia, nitric acid, &c.

The source of the carbonate of soda which exists so uniformly, and to so considerable an extent, in the deep waters of London, has been the subject of much speculation, and is even now undecided. The general opinion at one time entertained was, that it resulted from the admixture, and mutual reaction, of infiltrated sea-water, rich in soda salts, with proper chalk water, containing much bicarbonate of lime. The principal arguments in favour of this view were considered to be the following:—Water from chalk wells, situated above the level of Trinity high-water mark—the Watford water for instance—is comparatively free from soda salts, which exist so largely in sea-water; whereas, these salts are found to a considerable extent in the water of chalk wells descending greatly below high-water mark, such as the deep-well water of the London basin. Again, the high-chalk water, though poor in soda salts, is rich in carbonate of lime, whereas, the deep chalk water is comparatively rich in soda salts, and poor in carbonate of lime; and this difference in character has been thought to indicate mutual decomposition of the soda salts of the sea, with the carbonate of lime of the proper chalk water, whereby carbonate of soda is produced in the deep-well water. Moreover, it has been stated that the proportion of soda salts in the deep-well water of London was gradually increasing, a circumstance which, it was conceived, could scarcely occur unless that water had some communication with the sea. The above view has been controverted, and, as I think, successfully, by Mr. Dugald Campbell.† He has shown that the alleged increase of soda salts in the deep-well water is a mistake; that the shallow chalk water contains an obvious amount of nitric acid which is not to be found in the deep well water; and finally, that no admixture of proper chalk water and sea water could account for the composition of the deep-well water as a whole. The following table of the principal constituents of the different waters, calculated, No. I. from Mr. D. Campbell's analysis of the Watford water; No. II. from my own analysis of the Guy's Hospital water; and No. III. from Mr. Schweitzer's analysis of the water of the English Channel, illustrate Mr. Campell's position. If the sodium of the deep-well water, for example, had been derived wholly from the sea, it ought to have been associated with at least 25·63 grains instead of with only 9·75 grains of chlorine:—

Constituents.	I.	II.	III.
Chlorine	0·84	9·75	1366·75
Sulphuric acic	0·39	9·24	164·99
Carbonic acid	8·00	6·90	1·01
Calcium	7·71	1·05	29·86
Magnesium	..	0·69	97·32
Sodium	0·77	16·61	744·69
Potassium	..	0·54	28·03

In reference also to the above view, it is worthy of observation that the deep chalk water of Southampton, which appears to be contaminated to a considerable extent with sea water, is entirely free from carbonate of soda.‡ In addition to other constituents of the sea, this water contains 62·8 grains of common salt in a gallon, whereas the Trafalgar Square water contains only 19·0, and the Guy's Hospital water only 16·0. Mr. Campbell has also shown the improbability of a modification of the above view—namely, that the deep-well water results from an admixture of the proper chalk water with sea water, which has undergone a change by percolating through an immense bed of chalk.

In the present imperfect state of our knowledge, the most probable ex-

* Dr. Taylor examined the water in October, 1859, and found it to yield 47 grains per gallon of fixed residue.

* *Annales de Chemie et de Physique*, 3ème sér., t. i. p. 381.

† *Quarterly Journal of the Chemical Society*, vol. ix., p. 22.

‡ Robson, *Quarterly Journal of the Chemical Society*, vol. 4, p. 7.

planation of the source of the carbonated alkali in the deep water of London, seems to me to consist in recognizing the decomposition of an alkaline silicate, chiefly silicate of soda, existing in the strata above the chalk. The presence of carbonated alkali in the deep water of Grenelle, which is free from salts of the sea, and the presence of salts of the sea in the deep water of Southampton, which is free from carbonated alkali, seem to negative the idea that the existence of carbonated alkali in certain deep-well waters is dependent in any way upon contamination with sea-water. That it may be derived from alkaline silicates is rendered probable by the following circumstances, namely, that alkaline silicates are among the most common constituents of minerals, and are known to suffer slow decomposition by the action of water containing carbonic acid, rain-water for example;* and that carbonate of soda is not confined to the deep-water from the chalk, but exists also in the water of the porous strata intervening between the London clay and the chalk. In a preceding part of this communication, the analyses of two waters from Mr. Burnett's well at Vauxhall are given. This well is so constructed, that the water of the grey sand above the chalk can be obtained separately from the water of the chalk itself. No. v. is the analysis of the chalk water, and No. vi. that of the sand water. It will be observed that the general characters of the two correspond closely, the principal difference being that the chalk water contains more carbonate of soda, and less sulphate of soda, than does the sand water. This is a difference which may be readily explained, by supposing the sulphate of soda of the sand water to undergo a partial decomposition with the bicarbonate of lime, which characterizes a pure chalk water. Moreover, it is quite possible that the formation of carbonate alkali, begun by the decomposition of alkaline silicates in the plastic clay and grey sand, may be continued by the decomposition of alkaline silicates in the chalk. My results with the grey sand water are not singular; Mr. D. Campbell examined a specimen of well water from the plastic clay, and found it to correspond closely in its characters with deep-well water from the chalk. Messrs. Clarke and Medlock again, in their examination of the Westbourne Park well water, observe, "the almost complete identity of water from the sand and that from the chalk." I am inclined to think that the principal source of the deep-well water of London is rain water, a considerable proportion of which has drained through the highly porous sand formations beneath the mottled clay, into the chalk, which constitutes its principal reservoir. The porous eocene beds, intervening between the London clay and the chalk, have a very extensive superficial distribution for the reception of rainfall. On the south, they are found in Kent, at Woolwich, Blackheath, and Bromley, &c.; and in Surrey, beyond Croydon, and at the Addington Hills. To the north of London, they appear at the surface in parts of Hertfordshire, and of Middlesex, particularly in the neighbourhood of Bushey. This view of the source of the carbonate of soda in deep-well water does not account in any way for the presence of the chloride of sodium. It is not contended, however, that the well water is entirely free from sea-contamination, but only that sea-contamination is not the cause of its alkalinity. From the fact of portions of the chalk, and of the much more porous strata above it, cropping out as we proceed eastwards along the course of the Thames to the sea, it seems not improbable that the deep water of London should be contaminated to some extent with sea water. The deep water of the Paris basin, indeed, is free from sea salt; but then the direct distance of the chalk under Paris from the sea, the altered relations to the sea of the littoral chalk itself, which, in some parts eastwards, rests upon a bed of Kimmeridge clay, forming a portion of the sea-bottom, and the non-communication of any porous strata above the chalk with the sea, render the case of the Paris basin very different from that of London, as regards its liability to sea-contamination. Moreover, at Grenelle, the boring has pierced through the chalk, and entered the lower green-sand formation, from which, I believe, the supply of water is principally derived.

PHILADELPHIA GAS-WORKS.

REPORT ON ALLEGED INCREASE IN GAS ACCOUNTS.

(From the *Journal of the Franklin Institute.*)

To the Select and Common Councils of the City of Philadelphia.

The committee on gas-works, to whom were referred the following resolutions, viz.:

"Resolved,—By the select and common councils of the city of Philadelphia, that the committee on gas-works be instructed to inquire and report whether the manufacture of gas from any materials other than those now in use at the Philadelphia Gas-Works, is practicable; and if so, whether such gas can be manufactured at a cheaper rate than is now charged, and if so, at what rate; and whether such gas gives an equal or greater degree of light than that manufactured from coal; and if thought practicable, what cost will be incurred in change of apparatus, &c., and any other information relative to the subject, which they may deem important.

"Resolved,—That they be further instructed to inquire and report from what cause (if it can be ascertained), the bills of consumers of gas have been, of late, so largely increased; whether from defective meters, or from inferior quality of gas furnished, or from other causes.

"Resolved,—That the committee be instructed to report at as early a day as convenient."

Respectfully report,—That in reference to the first resolution, the committee are not, as yet, prepared to report.

In pursuance of the second resolution, directing inquiry into the cause of the recent increase of the amount of gas bills, it seemed right for the committee first to ascertain whether the increase referred to had any existence in fact.

For this purpose a statement has been compiled from the bill books of the gas offices, exhibiting all the bills issued in the months of December, January, and February, during four successive years, to all consumers who for that time have continued to use gas in the same premises, in the wards comprising the old city proper, Moyamensing, Spring Garden, Penn Township, and West Philadelphia.

This statement comprises the bills of 11,114 consumers, to whom more than 44,000 bills were issued during the four winters.

It appears that the bills of 3259 of the consumers, or not quite one-third, are higher in the last winter than in those of the three previous years, and the bills of 7855, or rather more than two-thirds, are not higher than those for previous years.

The aggregate amount of all the bills to these consumers in the winter of

	Dols.
1856–57 was	138,177·70
1857–58 „	125,762·24
1858–59 „	137,923·36
1859–60 „	141,368·54

the increase of 1859–60 over 1856–57 being 3190·84 dols., or about 2¼ per cent.

The reports of the inspectors of fittings show that in the interval between 1856 and 1859, the number of additional lights put on by the consumers included in the foregoing statements, is 8300, or about 6 per cent. increase of lights, if these customers are supposed to have in use the average number of lights, which is shown by the published reports to be twelve to each consumer.

From this it appears that the amount of gas used has not increased as much as the number of lights in use; and a similar result is exhibited by comparing the whole quantity of gas sold in the year with the whole number of lights in use at the beginning of the year. For example, the number of lights reported to councils, as in use in January, 1856, was 300,406, and the cubic feet of gas sold in that year was 415,888,950, being 1384 feet to each light. The lights reported in use in January, 1859, was 378,462, and the cubic feet of gas sold in that year was 494,128,345, being 1305 feet to each light, or 5½ per cent. less than before.

These comparisons have been carried back so as to include four years, in order to avoid the erroneous conclusions which would result from taking only the past two years, which included a period of commercial depression, the effects of which are very marked upon the consumption of gas by certain classes of consumers; among whom the various manufacturers present very conspicuous examples; while among other classes not thus affected by business, the quanty of gas consumed has been curiously regular, sometimes the bills for three or four successive winters not materially varying in amount, and in thousands of instances not differing so much as one dollar for several years. The aggregate amount of the bills for the periods of commercial distress, and also the average consumption per light in use, are shown to be diminished in a remarkable degree, and gives strong confirmation to the other proof elicited by this laborious investigation of the carefulness and accuracy with which the books and accounts of the City Gas Trust are kept.

The table of annual consumption per light, compiled from the published reports to councils, shows the average amount of gas used per light to be less in 1859 than in any other of the eighteen years elapsed since the city has owned the gas-works, except 1857 and 1858, when the consumption was so much reduced by the suspension of business.

In addition to the statements exhibiting the foregoing facts, relating only to consumers who have been supplied during four successive years, two others have been prepared, embracing all those consumers who have used gas during the last two winters in Southwark and Kensington.

These comprise two bills for each of 3408 consumers, amounting to 6816 bills, and make an aggregate of more than 50,000 bills, whose amounts, making a total of 543,231·84 dols., have been examined and compared in this investigation.

In the first named district the gas was derived from the City Works during both winters; but in the former season, received only an inadequate supply, in consequence of the imperfect communication between the local main of the Southwark Gas Company and those of the City, from which the supply was drawn, which defects were removed in the summer of 1859.

The aggregate of the bills here on the 1st of March, 1859, was 10,652·79 dols., and in March, 1860, was 11,683·24 dols., the increase being 1030·45 dols., or not quite 10 per cent.

In Kensington, the bills rendered by the Northern Liberties Gas Company on the 1st of April, 1859, amounted 12,573·42 dols.; and those by the City Gas-Works to the same consumers for the corresponding period in 1860, amount to 10,224·74 dols., the former amount being greater by 2348·68 dols., or 22 per cent. over the latter.

Part of this gain to the people of Kensington, results from the lower price now paid per 1000 cubic feet; but the books show that nearly one-half of it is in the saving of gas consumed, which is nearly 10 per cent. less since their supply from the City Works. It is proper to remark, in this connexion, that the saving to the City of cost of gas for public lighting, by the purchase of the Kensington Gas-Works, is about 5000 dols. a year; while the quantity of light in the streets is generally greater since the change in the source of the supply.

In Southwark, out of 1618 bills rendered, 1029 were larger in 1860 than in 1859, and 589 were not larger.

In Kensington, out of 1790 bills rendered, 378 bills were larger in 1860 than in 1859, and 1412 were not larger.

The unavoidable conclusion to which the committee has arrived, after a careful consideration of the foregoing facts, is, that there has been no general increase in the amount of gas bills, nor any local increase that is not evidently the result of an increased facility of supply; and, moreover, that an examination of the accounts of the many thousands of gas consumers kept in the offices of the city gas trust will satisfy every unbiassed mind as to the regularity and reliability of the records of consumption given by the instruments used for the measurement of gas.

The voluminous statements compiled from the bill books for the use of the committee, are kept open to the inspection of any member of councils, and, indeed, of any citizen who may desire to examine them, and thus form his own judgment as to the accuracy of the statistics that have been derived from their critical analysis.

Philadelphia, April 19, 1860.

THE SATURDAY HALF HOLIDAY MOVEMENT.—The directors of the Equitable Gas Company have, upon the recommendation of their engineer, Mr. H. Brothers, agreed to allow their workmen to leave at 2 o'clock on the Saturday afternoon, instead of at 4 o'clock as had previously been the custom—a concession for which the men express their grateful thanks.

DR. J. NORTHCOTE VINEN'S FORTNIGHTLY REPORT ON THE GAS SUPPLIED BY THE SURREY CONSUMERS COMPANY.—

Week ending.	Number of Observations.	Maximum Light. Candles.	Minimum Light. Candles.	Average Light. Candles.
January 26	4	14·36	12·46	13·59
February 2	4	14·19	13·01	13·50

The volume of hydrocarbons amounted to 5 per cent. There was no carbonic acid. Ammonia was present on Jan. 23, 25, 29, and Feb. 2. There was no trace of sulphuretted hydrogen. The maximum pressure was 3 inches; the minimum, 2-10ths. The ordinary pressure during the day and evening has lately been very low, varying from 4-10ths to 9-10ths of an inch.

* A portion of the sand-stratum overlying the chalk, obtained from the borings of Guy's Hospital well, was found to contain a considerable proportion of a readily-decomposible silicate of soda.

PHŒNIX GASLIGHT and COKE COMPANY.

NOTICE is hereby given, that the ADJOURNED HALF-YEARLY GENERAL MEETING of PROPRIETORS, holding, previous to Nov. 20 last, Five Shares and upwards in the said Company, will be held, pursuant to the Act of Incorporation, on WEDNESDAY, the 20th instant, at Twelve for One o'clock, at the Three Tuns Tavern, No. 87, High Street, in the Borough of Southwark, for the purpose of declaring a Dividend to Christmas last, to elect Directors and Auditors for the ensuing year, and on other business.

By order of the Court of Directors,
CHARLES PRIDDEN, Secretary.
70, Bankside, Southwark, S. E.
Feb. 9, 1861.

The Half-Year's Dividend, as before, will be clear of Income-Tax, and will be payable immediately after the business of the meeting has terminated; and afterwards at the Company's Office, at Bankside, on Thursday, the 21st inst., and also on Monday, the 25th inst., on both days from the hour of Twelve till Three, and from that time on Wednesdays only, from Two till Four o'clock.

TO be Sold—Four Dry-Lime Purifiers, each 7 ft. 8 in. × 6 ft. × 3 ft. 6 in., with 10 in. Water Lute, 8 in. Connexions, Centre Valve, and Lifting Crane, complete, and four tiers of Wrought-Iron Sieves.

Also a GASHOLDER, 50 ft. × 13 ft., with six Cast-Iron Columns and Guides, and counterbalanced at three points.

Also a GASHOLDER, 40 ft. × 12 ft., with four Cast-Iron Columns, triangular Wood Frames, and counterbalanced.

The above are all in good condition, and only parted with to make room for extensions.

For price and further particulars, apply to Mr. HUNTER JONES, Gas-Works, NORTHAMPTON.

TO ENGINEERS AND CONTRACTORS.

NOTICE is hereby given that the LLANDOVERY GAS COMPANY (Limited), are desirous of receiving TENDERS for the Erection of GAS-WORKS, with all necessary Meters, Mains, and Fittings, to be erected in or adjoining to the Town of Llandovery, in the county of Carmarthen.

Such Tenders to be sent to me, the undersigned, in writing, prepaid, on or before the 15th of February next.

The Company do not pledge themselves to accept the lowest or any other Tender.

WILLIAM MORGAN, Secretary.
Stone Street, Llandovery, Jan. 16, 1861.

THE Provanhall Coal Company beg to intimate that they are prepared to ship their Cannel Coal at Glasgow, Grangemouth, or Leith, and to deliver the same at places having communication by Railway.

Analyses by Professor Penny, and Certificates from Parties using the Coal, will be forwarded, and terms learned on application at their Office, 20, Jackson Street, GLASGOW.

TO GAS COMPANIES AND PROPRIETORS.

WANTED, the entire or partial MANAGEMENT of a Provincial Gas-Work, or LEASE of one; or the Advertiser would advance £500 to £1000 to enlarge any existing Work, and take proportionate profit and share of management.

Address by letter to A. B. B., care of Messrs. CHEVALIER and Co., 12, Bell Yard, Temple Bar, LONDON.

CAST-IRON Tanks and Gasholders for Sale.—To make room for contemplated alterations within their works at Leith, the Edinburgh and Leith Gaslight Company have resolved to dispose of two CAST-IRON TANKS, with their respective Gasholders and appurtenances, together or separately, all as presently in good working order at the works.

The Larger Tank is 39 ft. 9 in. diameter, and 18 ft. deep. The Smaller, 34 ft. 6 in. diameter, and 16 ft. 2 in. deep, inside measure. The capacity of Gasholders about 21,000 and 14,000 cubic feet respectively. The whole has been well constructed, and the Tanks, being entirely above ground, are strong and in excellent preservation, and removable with great facility for reconstruction as Gas or Water Tanks immediately after purchase. The Vessels and Apparatus may be examined on application to the Subscriber at the Works, to whom offers from proposing purchasers may be communicated till the 1st of March next.

JOHN REID, Engineer and Manager.
Edinburgh and Leith Gas Company's Office,
8, George St., Edinburgh, Feb. 7, 1861.

TO be Sold—230 2-light Wet Meters; also 25 NEW D IRON RETORTS, 8 ft. 6 in. long; 80 MOUTH-PIECES for ditto; 21 NEW ROUND IRON RETORTS, 16 in. diameter, 8 ft. 6 in. long; and 108 ROUND IRON RETORTS, partly used; with 53 OVAL, 132 ROUND MOUTH-PIECES; 75 4-in. ASCENSION-PIPES; and 118 DIP-PIPES for circular Main.

Apply to the ENGINEER, at the Works of the London Gaslight Company, VAUXHALL.

GAS PURIFIERS FOR SALE.

THE Committee of Management of the GREENOCK GAS-WORKS have for sale (deliverable in April next) FOUR DRY LIME PURIFIERS, each 13 feet 4 inches long, 8 feet 2 inches broad, and 4 feet 6 inches deep (inside measurements), with connexions, four tier of malleable iron sieves, wrought-iron covers, and lifting-crane; for all which they will be glad to receive Tenders. The purifiers are in excellent condition, are in constant use, and are to be parted with solely because the committee intend to procure others of a larger size.

Further particulars may be obtained on application to the MANAGER, by whom Tenders will be received till March 1, 1861.

The Committee do not bind themselves to accept the highest or any Tender.

ALEXANDER RITCHIE, Manager.
Gas-Works, Greenock, Jan. 12, 1861.

LOANS ON DEBENTURE BONDS.

THE Directors of the South Stafford- SHIRE WATER-WORKS COMPANY are prepared to receive TENDERS for LOANS on Debenture Bonds, to pay off those falling due.

Proposals, stating amount, rate of interest, and period for which offered, to be addressed to the SECRETARY of the Company, at their Offices, Bridgman Place, WALSALL.

J. CHURCHILL, Secretary.
Walsall, Nov. 6, 1860.

WOLVERHAMPTON RETORT WORKS.

ESTABLISHED **1840.**

JOHN EUNSON AND SON,

GAS ENGINEERS, AND MANUFACTURERS OF CLAY RETORTS,
AND FIRE GOODS IN GENERAL,

WOLVERHAMPTON.

Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

WILLIAM SUGG,

MANUFACTURER OF

PATENT DRY AND WATER GAS-METERS, TEST GASHOLDERS, AND APPARATUS,

"EVANS'S" PHOTOMETERS,

Experimental Meters, Minute Clocks, &c., Station Meters and Governors,

STREET-LAMP GOVERNORS AND LAVA BURNERS,

19 and 20, MARSHAM STREET, WESTMINSTER.

Price Current.

CASTINGS, PER TON.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle.	Wales.	Yorkshire, Derbyshire, and Staffordsh.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	3 5 0	2 10 0	2 12 6	3 0 0	3 5 0
1½ and 2 inches Socket-Pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3 " "	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
4 and 5 " "	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 in. and upwards "	5 15 0	4 15 0	5 0 6	5 5 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
" 2nd " cold "	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank Plates, ⅜ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 per cent. Discount.

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 ft., perft.	1 8	1 0	0 10	0 7	0 5	0 4½
" " " 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-Pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows—wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
" with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Plain Sockets [Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Syphons, 2 quart	1 0	0 8	0 7	0 5	0 4	0 3
	15 0	14 0	13 6	13 0	12 0	—

COALS, PER TON.

Newcastle.—Unscreened.	6s. 9d.	*Scotch Cannel.*	45s. 0d.
Whitwell Primrose		Boghead, at Leith	
Medomsley, Eighton Moor, and Burnhope	7 0	Kirkness, best	23 0
Pelaw	7 3	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7 6	" 2nd "	12 6
Pelton	7 9	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16 0	" " Leith	27 6
		Arniston	27 6
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	15 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.	8s. 9d.	*Foreign.—Per Keel.*	£10 0 0
Chatham & Rochester		Boulogne and Calais	
Cork	12 6	Barcelona	24 0 0
Dover	9 3	Bordeaux	16 10 0
Dublin	13 0	Cadiz	15 0 0
Exeter Quay	11 6	Copenhagen	10 0 0
Folkestone	9 3	Dieppe	10 10 0
London (Pool)	7 0	Genoa	22 0 0
Lowestoft & Yarmouth	6 0	Hamburg	9 10 0
Lynn	—	Havre	11 15 0
Portsmouth	10 6	Leghorn	22 0 0
Plymouth	11 0	Lisbon	16 10 0
Ramsgate & Margate	9 0	Rotterdam	—
Whitstable	7 0	Stettin	10 10 0
Weymouth	—	Trieste & Venice	£21 to 24 0 0

SUNDRIES.

Best Newcastle Fire-bricks	per 1000	50s. 0d. to 55s. 0d.	
Cliff's Fire-bricks, at Wortley	per 1000	55 6	
Ingham's Fire-bricks, at Wortley	"	55 6	
Fire-clay Retorts	per foot run,	5s. 6d. to 7 0	
Tough Cake Copper	per ton	£102 10s.	
English Pig Lead	"	21 5	
Welch Bar Iron, in London	"	6 10 0	
Tarred Rope Yarn	per cwt.	26s. 0d.	
Foreign Spelter	per ton	£18 10 0	
English Block Tin	"	128 0 0	
Banca	"	127 0 0	

TO GAS COMPANIES.

STOKERS' GLOVES,
11s. per Dozen.
S. CARPENTER, 3, BOW COMMON.

GEORGE BOWER,
GAS ENGINEER, MANUFACTURER, AND CONTRACTOR,
ST. NEOT'S, HUNTS.
References to between 100 and 200 Gas-Works Designed and Erected by the Advertiser.

THOMAS W. ALLSOPP,
GAS ENGINEER AND CONTRACTOR.
CASTLE DONINGTON, NEAR DERBY,
Manufacturer of every description of Gas Apparatus, Gasholders, Boilers, &c.

GEORGE CUTLER & CO.,
GAS ENGINEERS, &c.,
London Gasholder and Boiler Works,
8, WHARF, WENLOCK ROAD, CITY ROAD, N., LONDON.

Rye, Nov. 12, 1860.

Dear Sirs,—I consider it incumbent on me to acquaint you that the alterations recently made on the Rye Gas-Works—viz., the addition of a NEWLY-IMPROVED WASHER, and other work for the Purification of Gas, executed by the experienced workmen under your able supervision—are perfectly satisfactory to the Company, and the Gas is now as pure as it can be made.

I am, dear Sirs, your obedient servant,
CHARLES THOMAS, Superintendent,
Rye Gas-Works.

Messrs. Cutler and Co.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

SAMUEL CUTLER, Gasholder
MAKER and CONTRACTOR
For Tanks, Roofs, Purifiers, Condensers, Erection and Alteration of Works and every description of GAS APPARATUS.
PROVIDENCE IRON WORKS,
MILL WALL, POPLAR, LONDON, E.
Main Laying and Gas-Works erected complete.

WEST and GREGSON, Gas-Meter
MANUFACTURERS, &c.
UNION STREET, OLDHAM.
Station and Experimental Meters, Gas Pressure Registers, Gauges, Experimental Gasholders, Governors, Slide Valves, &c. &c.
W. and G. would respectfully call the attention of Gas Engineers and Managers to their Station-meters, having made and erected the largest in use at the present time, two of which may be seen at the Stockport and Liverpool Gas Works, on application to the respective Engineers.

WHITEHOUSE and CO., Boiler and GASHOLDER MAKERS,
GLOBE PATENT TUBE WORKS
WEDNESBURY,
Beg to draw the attention of Engineers and Managers of Gas Works to the superior quality of the Article they manufacture, both in respect of the iron employed, and the perfect manner in which it is welded; in proof of which they can refer to the testimonials of the most eminent Gas Engineers, and the experience of the principal of the large Gas Companies of the kingdom.
Orders promptly executed.

TO Mr. BENJAMIN WHITEHOUSE,
GASHOLDER MAKER,
WESTBROMWICH, NEAR BIRMINGHAM.
Sir,—I feel great pleasure in expressing my satisfaction at the manner in which you discharged your duties as CONTRACTOR for the TELESCOPIC GASHOLDER, 150 feet diameter and 60 feet deep, erected at this Company's Nine Elm Station in 1857. From that period to the present I have closely watched its working, and have never found the least defect either in workmanship or material.
During the recent heavy gales the Gasholder, although containing upwards of 1,000,000 cubic feet of Gas, showed no perceptible indications of its influence, but worked as freely and easily as usual.
RICHARD JONES.
Engineer to the London Gaslight Company.
Vauxhall, London, Nov. 9, 1859.

FLEXIBLE GAS TUBING,
VULCANIZED INDIARUBBER HOSE-PIPES,
WASHERS FOR STEAM-JOINTS, &c.

JAMES LYNE HANCOCK begs to inform the trade he has considerably improved the manufacture of his FLEXIBLE TUBING, both PLAIN and GLAZED. Made all sizes in 60 feet lengths.
INDIARUBBER GAS BAGS, fitted complete with Stop-Cocks and Tubes.
All orders to be addressed to JAMES LYNE HANCOCK, Vulcanized Indiarubber Works, Goswell Road, (opposite Spencer Street) LONDON (E.C.).

Now ready,

VOL. IX. of the JOURNAL of GAS LIGHTING, WATER SUPPLY, and SANITARY IMPROVEMENT, for 1860, price 21s., bound in cloth and lettered. A few copies of Vols. II., III., IV., V., VI., VII., and VIII. are still on sale.
W. B. KING, 11, Bolt Court, Fleet Street.

Just Published, price 3s., by Post, 3s. 2d.,

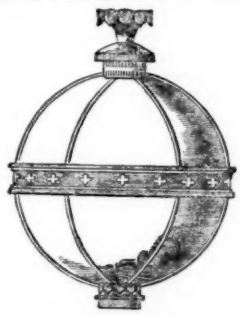
THE CHEMISTRY OF GAS LIGHTING,
with an Appendix containing a description of the different processes for the Manufacture of Colouring Matters from Coal Tar.
Re-arranged and reprinted from the JOURNAL OF GAS LIGHTING.
LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, E.C.

CAUTION.
TO GAS-METER MANUFACTURERS AND OTHERS.

THE Undersigned hereby caution Meter Manufacturers and others against infringing the exclusive right of the Undersigned to the use of the Screw Adjustment for regulating the Height of the Overflow-Pipes in Wet Gas-Meters, as described in the Specification of the Letters Patent granted to Crosley and Guldsmith on the 19th of April, 1856; as well as against infringing any other portions of that or any other Patent of the said William Crosley; and
NOTICE is further given, that all Infringers of the said Inventions, or any portions of them, will be proceeded against. CROSLEY & CO.,
103, SOUTHWARK BRIDGE ROAD,
LONDON, Aug. 29, 1859.

Gas Stoves, Gas Baths, Gas Cooking APPARATUS, warranted the best in England, at PHILLIPS'S, the original inventor and manufacturer, and general gas-fitter, &c., 55, Skinner Street, Snow Hill, LONDON, E.C.
PATENT SAFETY ATLAS CHANDELIERS, Sun and Star Burners, Outside Lamps, Patent Reflecting Lamps, Portable Coppers for either Gas or Fuel. Iron Tube and Fittings. Best quality for Gas, Steam, or Hot Water, &c. &c.

GLOBULAR LAMPS,
Ready Glazed, from 17s. 6d. each.



LAMP-POSTS
Of a Superior Class in Stock as well as the Ordinary Descriptions.
Engravings and Prices on application to
WILLIAM HOOD,
12, UPPER THAMES STREET, LONDON.

WILLIAM BLEWS AND SONS' IMPROVED MACHINE-MADE BURNERS, WROUGHT-IRON BATSWINGS,
FOR RAILWAY STATIONS AND MARKETS,
GAS-FITTINGS, CHANDELIERS,
BRASS AND IRON TUBES OF EVERY KIND
SUPPLIED ON THE BEST TERMS,
AT THE WORKS,
9, 10, 11, BARTHOLOMEW STREET,
BIRMINGHAM.

WALTER MABON, Engineer,
ARDWICK IRON WORKS, FAIRFIELD STREET
MANCHESTER,
Manufacturer of
IRON TANKS for Gasholders, Railway Stations, &c.
GASHOLDERS.—Extensive premises at Gorton, solely for the manufacture of Gasholders, and other heavy Wrought-Iron Structures.
GAS APPARATUS.—W. M. has an extensive assortment of patterns for Purifiers from 4 feet to 15 feet square, also round ones from 4 feet to 10 feet diameter; Scrubbers, Condensers, Washers, Columns, Girders, and Tripod Patterns, suitable for Gasholders, from 10 feet to 150 feet diameter, either Single-lift or Telescope. Contractor for Gas Works of any Magnitude. Designs, Specifications, and Estimates furnished.
WROUGHT and CAST IRON ROOFS for Railway Stations, Gas Works, Warehouses, and Sheds, prepared for Slates or for Corrugated Iron.
IRON HOUSES, either for Dwellings, Manufactories, or Public Buildings.
PIPES and VALVES, for Gas and Water, from 2 inches to 48 inches bore.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

JOSEPH CLIFF and SON,
FIRE-CLAY WORKS,
WEST DENTON, NEWCASTLE-ON-TYNE,
Manufacturers of Clay Retorts, Fire-Bricks, Lumps Tiles, &c.
The seam of Clay from which these goods are made is noted for its fire-resisting properties. Prices very moderate.
Office, 52, Quay Side, Newcastle-on-Tyne.

BELGIAN CLAY RETORTS.

ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Albert Keller, of Ghent, begs to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by him. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications, addressed to ALBERT KELLER, GHENT, will receive immediate attention.

JAMES NEWTON,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANT,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and CLAY, and every Article suitable for
GAS AND WATER WORKS.

HARRIS and PEARSON,
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY.
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &C.
AMBLECOTE FIRE CLAY AND BRICK WORKS,
STOURBRIDGE.
Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.
NB. A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches, 16 inches. D's, 16×12, 15×14, 20×16, 16×18.

WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE,
MANUFACTURERS OF EVERY DESCRIPTION OF
FIRE BRICKS, CLAY RETORTS, LUMPS, TILES,
&c. &c.
LONDON OFFICES:
76, KING WILLIAM STREET, CITY.
A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

STOURBRIDGE FIRE-CLAY WORKS.

E. BAKER and CO.
(Contractors to Government).
24 WHARF, HARROW ROAD, PADDINGTON, W.
Every article manufactured at their own Works and Mines, Brierley Hill.
FIRE-BRICKS, Lumps, Squares, Tiles, and Gas Retorts of all dimensions.
CRUCIBLE and CEMENT CLAYS.
GARDEN EDGINGS, of various patterns.
BUFF and ORNAMENTAL TILES.
CLINKERS and STABLE PAVINGS, noted for hardness and durability, being perfectly non-absorbent.
Shipments on the shortest notice.

F. SIMMONDS and SON,
RETORT AND BOILER-SETTERS,
AND CONTRACTORS FOR GAS-WORKS IN GENERAL, FOR MATERIALS AND LABOUR, OR LABOUR ONLY.
OFFICE:
2, YORK PLACE, KINGSLAND ROAD, N.E.
Contractors at the Chartered Gas-Works, Curtain Road, and numerous Provincial Gas-Works.

CAST-IRON Retorts, Socket Pipes, with Syphons and all requisite Connexions, Lamp Columns, Wrought Iron Tubing, Valves, Street Lamps, Sight Holes, Furnace Doors, Ash Pans, Charging and Coke Shovels, Iron Pails and Coke Barrows, Cross Bars, Fire Pots, Pumps, Iron Borings.
PURIFIERS, CONDENSERS, and SCRUBBERS erected complete, or the materials supplied; with every description of goods in use by Gas-Works, in stock, on wholesale prices, at
Mr. LYNCH WHITE'S,
Old Barge Iron Wharf, Upper Ground Street,
LONDON.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

THOMAS SEAVILLE TRUSS, C.E., 53, GRACECHURCH STREET, LONDON, E.C.

IMPORTANT TO GAS COMPANIES.

By Her Majesty's Royal Letters Patent.

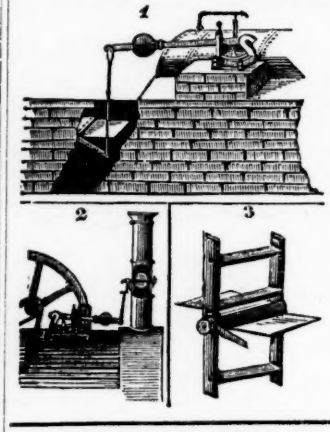
PATRONIZED BY THE LORDS COMMISSIONERS OF THE ADMIRALTY.

R. BARRETT & CO.,

STEAM DAMPER AND FIRE REGULATOR.

CHARLES ROBERTS, AGENT, 17, GRACECHURCH STREET, LONDON.

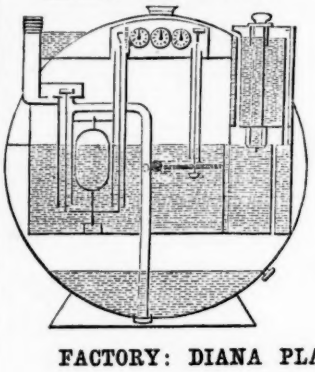
(TAYLOR AND WEBSTER'S PATENT.)



This Apparatus, from its simplicity of construction, can be easily affixed by any engineer; and, in addition to its being a preventive of boiler explosions, will effect a saving of about 15 to 20 per cent. in fuel. It is suitable for all descriptions of boilers, and can be applied to any at present in use. The following Engineers of Gas Companies have adopted them, of whom reports may be had upon application:—

Imperial Gas Company,	Haggerston,	Mr. Clark, Engineer.
,, ,, ,,	Battle Bridge,	Mr. Methuin, ,,
,, ,, ,,	Fulham,	Mr. Kirkman, ,,
Commercial Gas Company,	Stepney,	Mr. Jones, ,,
Ratcliff Gas Company,	Ratcliff,	Mr. Wilton, ,,
Surrey Consumers,	Rotherhithe,	Mr. Croll, ,,
Equitable Gas Company, Woolwich, Consumers Gas Company, Woolwich,		Mr. Stark, ,,

PATENT WET METER.



N. DEFRIES,

CONSULTING GAS ENGINEER,

Inventor and Patentee

OF

WET GAS-METERS,

WITH SELF-ADJUSTING WATER-LINE;

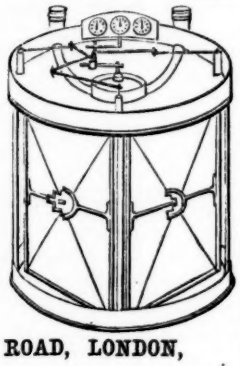
DRY METERS,

GAS-HEATING BATHS, OVENS, STOVES,

GAS FIRES with INDESTRUCTIBLE FUEL,

&c., &c.

PATENT DRY METER.



FACTORY: DIANA PLACE, FITZROY SQUARE. OFFICE: 406, EUSTON ROAD, LONDON,
Eight Doors from Factory.

Attempts having been made to construct Self-Supplying Apparatus to Wet Gas-Meters upon the Bird Fountain principle,—which, although unerring to supply water in the open atmosphere, has not wholly succeeded so as to be relied upon when enclosed in a Gas-tight Meter Case,—N. DEFRIES begs leave most respectfully to acquaint Gas Companies, and the Public in general, that he has constructed his PATENT WET GAS-METER upon a method entirely different, being founded on the well-known principle of the self-acting supply of the Oil Lamp, which has never been applied for the adjustment of the Meter Water-Line before, and which, by the admission of external air to a chamber sealed from Gas, will never fail to faithfully perform its required function. They are of the very best materials and workmanship, will stand more pressure than is required as the test for soundness by the New Act, are guaranteed to prevent surreptitious burning without detection, and will be kept in repair free of charge for seven years.

N. DEFRIES'S CELEBRATED DRY METERS,

of which more than 80,000 are in use in Palaces, Churches, Chapels, Royal Dockyards, Club Houses, Public Offices, and other Buildings throughout the Empire and Continent, which have done so much in checking surreptitious burning, and simplified the fitting up of Gas.

To remove any doubt of accuracy of measurement his Meter for 1500 lights, in use upwards of ten years at the Royal Italian Opera, until that Building was destroyed by Fire, was long afterwards dug out of the burnt ruins, then tested by the Chartered Gas Company in the presence of George Lowe, Esq., F.R.S., and other Chief Officers, and found inflexibly correct. Also, on the 9th of June, 1858, at the Western Gas-Works, his Meter for 150 lights, after considerable use, was doubted, and subjected to the most variable tests—from the full lighting to a single Jet—and in each case, as in other instances, accuracy was finely indicated.

As to durability, his two large Meters at the Thames Tunnel have been in use night and day for upwards of twelve years—one continuation of dark hours—subjected to the wear and tear of seventy-five years as compared with the ordinary business hours of using Gas above ground.

LORD REDESDALE'S SALE OF GAS BILL.

All Meters constructed by N. DEFRIES are guaranteed to pass the Provisions of the Standard.

No alteration has been necessary in the Meters he continues to supply to the Chartered, Imperial, City of London, Equitable, and other large Companies, his accustomed range of 1 per cent. over and under meeting all the desired requirements; whereas, by the New Act, a greater departure from accuracy—viz., 2 per cent. fast to 3 per cent. slow—is permitted.

PERRENS & HARRISON,

THE LYE FIRE-CLAY AND BRICK-WORKS, STOURBRIDGE,

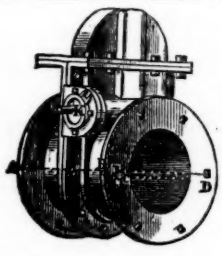
Successors to the late firm of J. and W. KING,

and Sole Proprietors of their well-known CLAY MINES, are prepared to supply

GAS-RETORTS, CLIFT'S PATENT GAS-OVENS and FIRE-BRICKS

OF ALL DESCRIPTIONS,

the superior quality of which will, they are confident, secure them further orders.



BRYAN DONKIN & CO.

keep always on stock their

IMPROVED GAS VALVES

from 2 inches to 18 inches, price 11s. 6d. to 13s. 6d. per inch diameter

List of prices, with full dimensions of all sizes up to 27 inches, to be had on application.

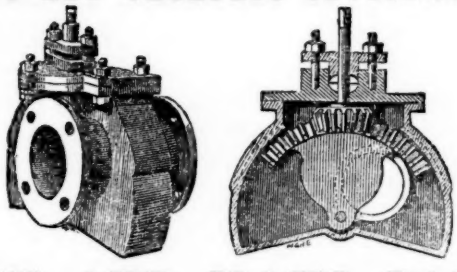
These Valves are all proved to 30 lbs. on the square inch before leaving the works.

BRYAN DONKIN & CO.,

ENGINEERS,

NEAR GRANGE ROAD, BERMONDSEY.

BEST AND CHEAPEST SLUICE-COCK.



BROWN AND MAY'S PATENT.

Above 3-inch diameter, price 10s. per inch. Brass face, 6d. per inch extra.

Can be taken to pieces without being removed from the line of Piping.

NORTH WILTS FOUNDRY, DEVIZES.

Wholesale Agents, Messrs. S. and E. RANSOME, 31, Essex Street, Strand, E.C., Where a Sample may be seen.

WALTER FORD,

LATE

PADDON and FORD,

GAS-METER AND APPARATUS WORKS,

GRAY'S INN ROAD, LONDON.

MANUFACTURER OF WET AND DRY GAS-METERS, STATION-METERS, GOVERNORS, &c. &c.

A large number of **STATION-METERS,** up to 80,000 feet per hour (being by far the largest in use), and **GOVERNORS** for **MAINS,** up to 24 inches, have been constructed by Paddon and Ford. These Meters and Governors possess peculiar advantages as regards strength and freedom of action.

Sole Manufacturer of **PADDON'S PATENT STREET-LAMP REGULATORS,** for insuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

JOSEPH BOULTON,

28, BAGNIGGE WELLS ROAD, CLERKENWELL,

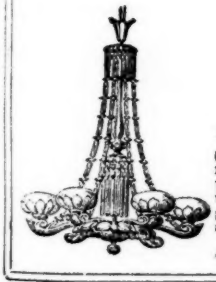
PATENTEE OF

DRY & IMPROVED WET GAS-METERS,

AND

GAS APPARATUS.

All Meters warranted to comply with the Act of Parliament.



F. & C. OSLER,

45, OXFORD STREET, LONDON;

Manufactory—Broad Street, Birmingham—Established 1807,

MANUFACTURERS OF GLASS CHANDELIERS, GLASS LUSTRES, TABLE GLASS, &c. &c.

ELEGANT CRYSTAL GLASS CHANDELIERS, for GAS, from £4 upwards (Made from "REGISTERED" DESIGNS), with GLASS BRANCHES, &c.; suitable for DRAWING-ROOMS and BALL-ROOMS. The more extensive use of GAS in private dwellings has induced Messrs. OSLER to direct their particular attention to the manufacture of this class of articles—which, with a view to their general adoption, are offered at very moderate prices. Purchasers can select from a great variety of patterns, to which additions are being constantly made.

THEATRES, CONCERT, ASSEMBLY, AND BALL ROOMS LIGHTED BY ESTIMATE ON THE LOWEST TERMS.

JAMES OAKES and CO.,

ALFRETON IRON WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20, WHARF ROAD, CITY ROAD, LONDON,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including best cold-blast Iron Retorts, Socket and Flange Pipes of all sizes, Bends, Branches, Syphons, Lamp Columns of various patterns, &c.

N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.

CHARLES HORSLEY, Agent.

C. H. is prepared to carry out the warming and ventilation of public buildings, &c.; also civil engineering in general.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET,

DURHAM.

Manufactory for every description of Casting and Machinery for Gas Works and Water Works.

Warehouse in London for Cast-iron Pipes and Connections of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

JOHN ROGERSON and CO.,

NEWCASTLE-ON-TYNE & MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

LONDON HOUSE:

12, ROYAL EXCHANGE BUILDINGS.

WROUGHT-IRON Guides for Gas-

HOLDERS, when Trussed upon scientific principles, are more capable of resisting strains, in every direction, than Cast Columns of any form can be; and weigh only one-fifth as much as the latter. Designs and Working Drawings for Guides and Ties can be obtained of the Inventor, CHARLES DIXON, C.E., Chichester, SUSSEX.

GAS COAL.

BEAL, WALKER, and CO., Coal and

COKE MERCHANTS, No. 1, Walker's Buildings, SHEFFIELD, beg to inform the Directors and Managers of Gas Companies, that they are in a position to contract for the supply of the different sorts of best Gas Coal, such as best Silkstone, Barnsley, and others, at the lowest prices, which may be had on application at the above Office.

ALFRED PENNY, Gas and

CONSULTING ENGINEER,

WENLOCK IRON WORKS,

21 & 22, WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

Plans, Specifications, and Estimates prepared.

JOSEPH WILLCOCK

(late BARLOW and CO.),

Mechanical and Architectural Draftsman, Designer, Serveyor, an Lithographer to Gas Engineers and Gas Apparatus Manufacturers, formerly Superintending Engineer at the largest Gas Apparatus Manufactory on the Continent.

Patent and Designs Office, 89, Chancery Lane, LONDON, W.C.

GEORGE ANDERSON, Gas and

CONSULTING ENGINEER,

104, LEADENHALL STREET, LONDON (E.C.).

DIRECT-ACTING GAS-EXHAUSTERS,

supplied either with or without Steam-Engines and Boilers.

FOUR-WAY DIAPHRAGM VALVES,

one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

RETORT SETTINGS,

designed to be heated by Tar alone, and with a total absence of Smoke.

Illustrated circulars, giving references and every information, may be obtained on application as above.

BENJAMIN GIBBONS, Jun.,

DEEPDALE FIRE-CLAY & BRICK WORKS,

Near DUDLEY,

Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

FIRE-CLAY RETORTS,

TO MODEL OR DRAWING.

B. G. begs to call the attention of Gas Companies to his Fire-Clay Retorts, which have been used with great satisfaction in some of the largest Gas-Works in the Metropolis and many Provincial Towns in England.

References given, if required.

WILLIAM INGHAM AND SONS,
WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

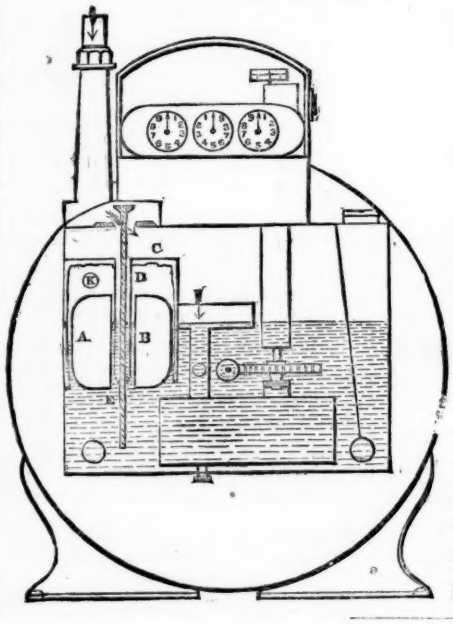
Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.
Estimates for Setting, or Bricklayers sent when required.
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.
A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.
N.B.—*Export orders continue to have prompt attention.*

LIVESEY FIRE-CLAY WORKS,
NEAR BLACKBURN, LANCASHIRE.
ORLANDO BROTHERS,
MANUFACTURER OF PATENT CLAY RETORTS,
AND EVERY DESCRIPTION OF
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.
FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

WILLIAM PARKINSON AND CO.,
(SUCCESSORS TO THE LATE SAMUEL CROSLEY,)
COTTAGE LANE, CITY ROAD, LONDON, E.C.
Established 1816.

PATENTEES AND MANUFACTURERS OF
STATION-METERS & GOVERNORS,
CONSUMERS' METERS & GOVERNORS,
AND OTHER GAS APPARATUS. Also,
METERS FOR MEASURING WATER.



IMPROVED LOW-SPOUTED GAS-METER,
WITH
NEW PATENT FLOAT ARRANGEMENT.

The Float A is partitioned off from the front frame considerably below the water-line, and is pierced perpendicularly by a tube B.

A large gas-way, C, is left between the top of the partition and the valve-seat. The small tube D, in which the float-wire works, is fixed to the top of the partition, and comes down below the water-line inside the tube B. The float-wire is soldered to the float at E, so as to allow water to pass into the tube D, in order to seal it. The chamber above the float is open to the outlet through the hole K.

The action of this float is exactly opposite to that of ordinary meters. The float is elevated by sudden pressure, and the valve cannot be closed except through want of water.

W. P. and Co. beg especially to call the attention of Gas Companies and others to this New Patent Meter, which entirely overcomes the difficulty experienced by ordinary wet meters, owing to the short range of the float, which is necessary in order to meet the requirements of the "Sale of Gas Act."

They are prepared to supply
TEST GASHOLDERS,
of the most approved description, graduated by the Standard.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable.

MANUFACTURED BY

CROSLEY & CO.,

GAS-METER MANUFACTURERS,

103, SOUTHWARK BRIDGE ROAD, LONDON, S.E.

N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

CROSLEY & CO. are also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by them, and verified by the ASTRONOMER ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by C. & Co. in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." They also supply

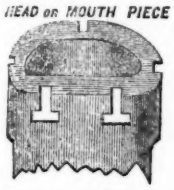
TEST GASHOLDERS,

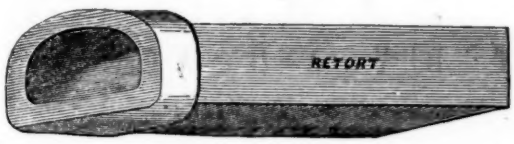
Graduated by the Standard Cubic Foot.

C. and Co. are the only house in the trade which has for years manufactured Meters according to the standard measure set forth in the 2nd Section of the "Sale of Gas Act," and which also comply with the rules laid down in the Section for testing meters. Purchasers of C. and Co.'s Meters may therefore be secured against any additional expenses being incurred in order to adapt their Meters to the requirements of the new Act.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.





KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

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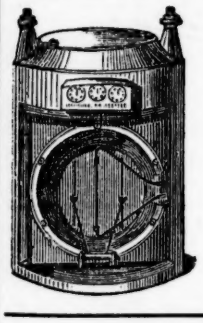

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